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Global biodiversity

An International Forum on the Variety of Life on Earth...
research, conservation and wise use

VOLUME 4 ■ NUMBER 4 ■ SPRING 1995

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Editor's Notebook

ELECTRONICS AND BIODIVERSITY

Biodiversity deals with numbers—large numbers. It is estimated that 10 million to 100 million species of plants, animals, and microorganisms live on Earth, most of which are yet to be discovered, named, and classified. The up to 100,000 genes, collectively called the genome, of a single species may be "written" in 3 billion 4-letter codons. Most genomes remain to be delineated and mapped. Each species is linked to dozens or hundreds of species through relationships such as symbiosis, competition, predation, herbivory, and parasitism—a vast ecological void in knowledge.

Yet knowledge of biodiversity needs to be discovered and communicated. Conservation, ecologically sustainable use, the new bio-industries, and education are amongst the important clients of knowledge created by biosystematics, ecology, and genetics. How can the flow of knowledge be increased to these clients? Are the classical media—scientific papers, published monographs, and popular guides—adaptable and cost-effective to handle the need for improved flow? Can other media complement or replace traditional means?

In this and in future issues, *Global biodiversity* will explore electronic media such as the Internet, CD-ROMs, computer databases, and geographic information systems (GIS). In the meantime, I encourage you to hook up to the Canadian Centre for Biodiversity section on National Capital Freenet. For more information, please see the article on page 36.

Don E. McAllister

Don E. McAllister
Editor

The goals of Global biodiversity are to:

- *Publish articles, views and news on biodiversity*
- *Bridge the gaps between professional disciplines & the public*
- *Communicate vital information to help humankind make decisions on the fate of the Earth's life*
- *Express views on the needs & value of biodiversity research*
- *Provide an international forum for discussing issues on biodiversity*
- *Enhance awareness of the role of biosystematic research & museum collections to conservation & ecologically sustainable use of biodiversity*
- *Discuss methods and philosophy of biodiversity conservation*
- *Review books and major articles on biodiversity*

News, views, articles for publication and books or papers for review should be sent to:

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It would be helpful if longer manuscripts were submitted in WordPerfect or ASCII format on either 3 1/4" or 5 1/2" inch diskettes, with a hard copy printout to show italics, etc., if in ASCII.

Cover image is a Prairie Crocus, *Anemone patens*, representative of biodiversity in the prairie landscapes of North America.

Global biodiversity

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Prairie Crocus *(Anemone patens)* **43**
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■

Towards a lasting forest*

Canada is a lead producer of forest products and has taken its first steps to change industrial forest management to ecoforestry. These steps include a greatly increased use of recycled fibre in paper production, phasing out of pesticide use (Quebec), and the establishment of ecoforestry courses (British Columbia). The author of this article cogently argues that to maintain its economic leadership and to sustain its forest ecosystems, Canada must vigorously take new initiatives, including launching a green forest product certification programme. [D.E.M.]

Jacques Prescott is President of the Canadian Chapter of the IUCN and also, President of the Union for Sustainable Development.

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BRAZIL OF THE NORTH

We have all heard of the threat of boycotts from European markets on Canadian forestry products. These originate in Germany where the Green movement has formed a political party that has already been sitting in parliament for a number of years. Renowned for their skills with the media, German ecologists have taken their cause as far as the European Parliament—which is seriously considering following through with their demands. More specifically, the European Parliament's Green Party is recommending a global moratorium on the import and export of cut wood from all sources (including the northern forests) until methods of cultivating and harvesting are developed that do not lead to the destruction of ecosystems or natural habitats. The Party recommends the implementation of a certification program for cut wood extracted by methods that respect the environment as well as the implementation of an active policy for selective reforestation—all the while satisfying ecological criteria (Les Verts au Parlement Européen, 1992).

Notably, this boycott threat has as its origin practices by certain Canadian forestry companies of exploiting primary and old growth forests and clear-cut logging on large areas—practices that have earned Canada the unenviable title of Brazil of the North.

In British Columbia, public opinion has been inflamed by coordinated campaigns from native and ecological groups against logging on South Moresby and Clayoquot Sound. In 1985, on the Pacific coast, Haida Indians mobilized ecological groups to protect their ancestral lands against logging. After two years of an agressive and highly emotional campaign, the federal government of Brian Mulroney and the British Columbia government of Bill Van der Zalm jointly created South Moresby National Park in the Queen Charlotte Islands. At a cost of $106 million to the federal government, the goal was not only to establish the national park, but also to diversify the local economy by encouraging the development of the tourism industry.

Encouraged by this victory and using the same techniques that proved successful for South Moresby—road blocks, public demonstrations, civil disobedience, representations on the international scene, and mobilization of public opinion—ecologists have leapt to the defense of other old growth forests such as those in the Carmanagh Valley and Clayoquot Sound.

Within such a context, we may ask ourselves: Why we do not just sit down at the same table and negotiate? Here is the reason. Since the early 1970s, the government of British Columbia has regularly invited environmentalists to sit on teams tasked with establishing plans for the exploitation of certain regions. An exceptional site in Clayoquot Sound, Meares Island, was one of these regions. After three years of work, the

* translated from the French

planning committee presented its plan for the exploitation of Meares Island, which included the integral conservation of a large part of the island. Not happy with the results, MacMillan Bloedel, one of two companies holding logging permits on the island, dissociated itself from the team to negotiate directly with the government, with the result that 90% of the island was allocated to logging. The recommendations from the planning committee were simply ignored (Daniel 1989). Since it cannot respect its adversaries, MacMillan Bloedel has come to represent, for many, the devil himself.

Many will say that the situation in Quebec differs from the one in British Columbia. Recall simply that in 1986, the harvest from logging was 4 million cubic meters greater than the biophysical yield estimated at 22 million cubic meters for the combined public and private territories (Paillé and Mathieu 1986). During this same period, floating of logs, clear cutting, and the use of chemical products were also raising numerous environmental concerns.

CAN THE LOGGING INDUSTRY AND ECOLOGISTS MAKE PEACE?

At first glance, the points of view of ecologists and those of the logging industry seem irreconcilable. But taking a closer look, would it not be possible to bring the two sides closer by identifying common objectives? The answer can be found in part in the concept of sustainable development proposed by the Brundtland Commission, as well as in the objectives aimed at in Agenda 21 and in the Convention on Biological Diversity adopted in Rio de Janeiro in 1992.

The World Commission on the Environment and Development (1988) defined sustainable development as development that satisfies today's needs without jeopardizing the capacity of future generations to satisfy their own needs. Sustainable development also means improving the living conditions of human communities while remaining within the limits that ecosystems can support (IUCN, UNEP, WWF, 1991). Sustainable development ensures the simultaneous perpetuation of industry and ecosystems.

A sustainable economy is one based on an ecologically sustainable development; in other words, one that preserves the resource base upon which it depends. The objectives for sustainable development were adopted by the majority of countries, including Canada, during the Rio Summit on the environment and development. In Canada, these objectives were also adopted by the National Round Table on the Environment and the Economy, which includes numerous representatives from the private sector. The objectives are also shared by the majority of ecologists worldwide.

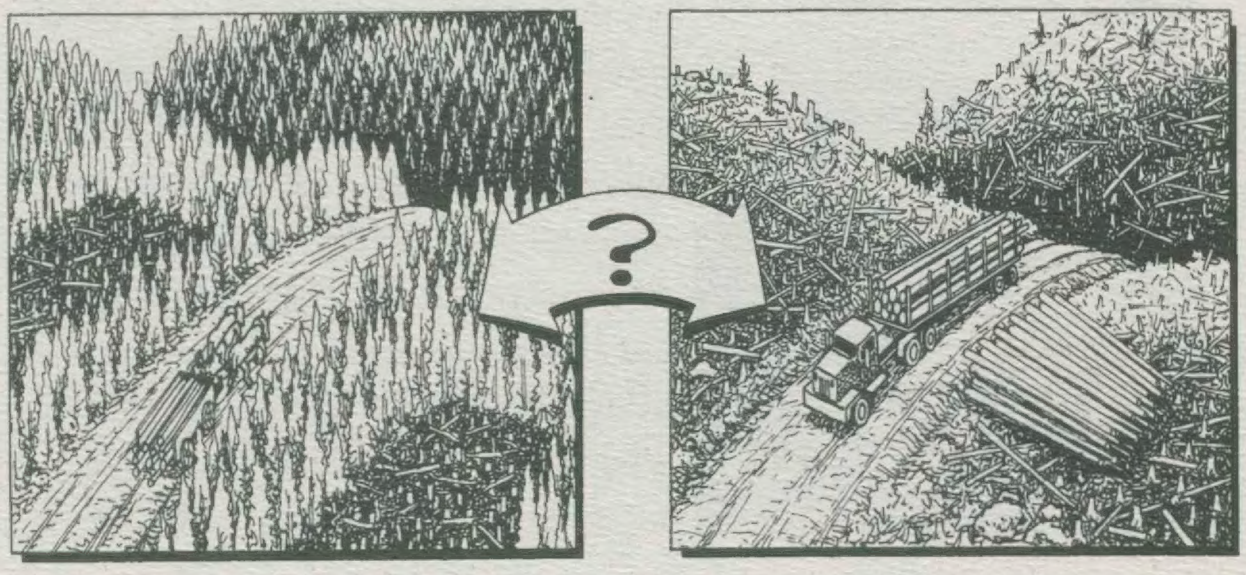
In particular, a sustainable development and economy includes the concept of sustained yield and diversified use of resources. It is precisely on these points that opinions differ. In British Columbia, for a sustained logging practice, ecologists estimate that the annual yield must not exceed 55 million cubic meters of wood. However, the industry currently cuts more that 91 million cubic meters of wood annually (Daniel 1989). As well, in order to maintain multifunctional use of the forest and an optimal level of natural reforestation, some ecologists maintain that clear cuts should not exceed two hectares, while current sizes reach 40 and sometimes even 75 hectares. In Quebec, before the new strategy for the protection of forests came into effect, the guide to intervention in the forestry industry allowed clear cuts of 250 hectares (maximum areas for clear cutting are now 100 hectares for evergreen forests and 50 hectares for deciduous forests). In a similar vein, Hammond (1994) from the Silva Foundation of British Columbia further recommends the integral protection of 50% of logging areas, and 20 to 30% of large trees in logging areas.

How do we find the middle ground between these extremes?

DESPERATE ILLS CALL FOR DESPERATE REMEDIES

The World Conservation Strategy recommends four principal actions leading to a sustainable forestry industry.

A sustainable economy is one based on ecologically sustainable development; in other words, one that preserves the resource base upon which it depends.



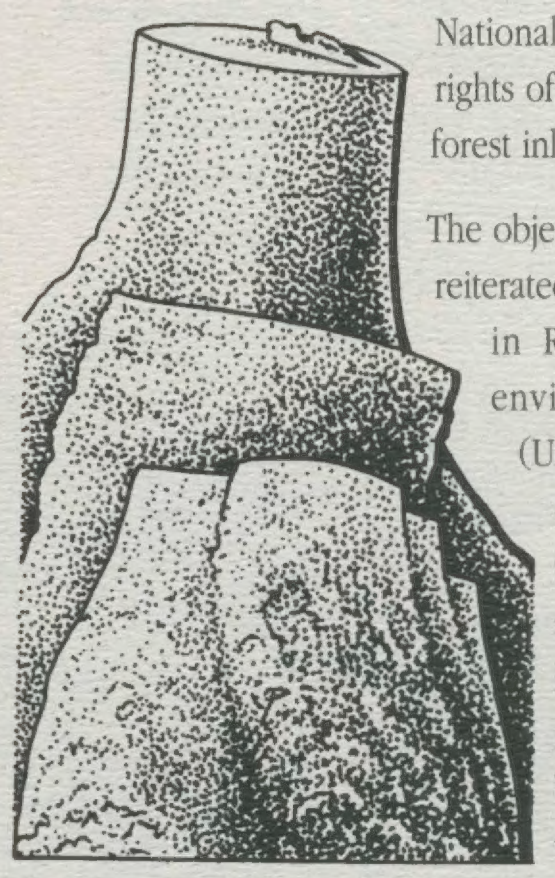
Each country should:
1) prepare an inventory of its forestry resources and develop a strategy for its management;
2) protect zones of natural forests and old growth forests in particular;
3) maintain and use in a sustainable fashion the modified forests and create plantations for intensive exploitation;
4) include local communities in the management of forests.

Many would no doubt find the implementation of these objectives difficult and even utopic, but in reality, this is the approach the European countries—the ones behind the threats of boycotts on our forestry products—are taking. Several international agreements now support these objectives—a fact that the forestry industry can no longer ignore.

The Declaration of Principles on Forests adopted during the Rio Summit states that forests should be managed in an ecologically viable fashion in order to satisfy the social, economic, ecological, cultural, and spiritual needs of current and future generations. These needs include wood and wood by-products, water, food and forage products, medicinal plants, fuels, building materials, employment, leisure, faunic habitats, and the diversity of landscapes (Conférence des Nations Unies sur l'environment et le développement 1992a).

The Declaration of Principles also states that we must recognize the vital role played by forests in the protection of fragile ecosystems, drainage basins, and freshwater reserves in terms of rich deposits of biological diversity and resources, sources of genetic material for biotechnological products, and reservoirs of carbon. National forestry policies should also respect the rights of native populations, local communities, and forest inhabitants.

The objectives of "The Declaration of Principles" are reiterated in other international agreements signed in Rio de Janeiro: Agenda 21, a sort of environmental agenda for the 21st century (United Nations Conference on Environment and Development 1992b), and the Convention on Biological Diversity. In accordance with this convention, Canada has committed itself to developing a national strategy for the conservation of biodiversity. Included in this strategy, which should be adopted in early 1995, is a chapter on forestry management. The application of the national strategy on forests launched in 1992 is encouraged (we will come back to this later) and an ecosystemic-based management of forests is recommended. The Canadian strategy on biodiversity also recognizes the need to increase efforts on follow-up and inventories of forest biodiversity and underlines the importance of minimizing the impacts from exploitation techniques on drainage basins, soils, and neighbouring ecosystems.



CHANGING OUR WAY OF LIFE TO SAVE OUR INDUSTRY

Fortunately, Canada and Quebec did not wait for the signature of all these agreements before undertaking a revision of forestry policies. In May 1992, just before the Rio Summit, after a vast pan-Canadian consultation, the Canadian Council of Forestry Ministers (which includes representatives from the private sector) made public a national forests strategy that advocates the objectives for an ecologically sustainable use of forestry resources and conservation of biological diversity (Conseil canadien des ministres des forêts 1992).

For constitutional reasons, Quebec did not endorse the Canadian strategy. The Quebec government preferred to develop its own strategy. The Project for Foresty Management Strategy (MER 1991) put forward by the Minister of Forestry in 1991 predated by several months the new world strategy on conservation. The Quebec strategy for the protection of forests created a veritable revolution in forestry practices by pushing for the maintenance of forestry yields, the respect of the environment's biophysical components, and the gradual elimination of pesticides. By submitting the strategy to public consultation, the Minister of Forestry courageously created a precedent that should encourage the involvement of citizens in the management of a resource that supports, we should not forget, the largest part of the Quebec economy (Commission sur la protection des forêts 1991). By publicly announcing, on 3 May 1994, the application of this strategy, the Minister of Natural Resources, Christos Sirros, demonstrated without a doubt that the green revolution has definitely been launched in Quebec (MRN 1994).

During the past few years, the Canadian forestry industry has made gigantic efforts to reduce the environmental impacts from its operations. In the next three years, the pulp and paper industry will invest more than $4 billion in the treatment of waste from its plants. A protocol was signed last March between the federal government and pulp and paper representatives with the goal of eliminating all industrial wastes (Vastel 1994). As well, our paper industry has become a world leader in the use of recycled fibre (since 1990, some 20 plants have been converted to the use of recycled fibre and our imports of recycled paper have gone from 20,000 to 1.2 million tons) (Elliot 1994). In spite of these efforts, it is our logging practices that continue to make the news. They are the Achilles heel of our industry.

Thus, our governments and the forestry industry subscribe to objectives for the management and the ecologically sustainable development of forests—the only way to ensure the continuation of our industry and ecosystems. Why, then, are we waiting to apply these principles and to launch our own certification program? During the ministerial conference for the protection of European forests held in 1993 in Helsinki, Canada tabled the basis for the ecological criteria that described sustainable forestry. These criteria included the conservation of biological diversity, the capacity for production, and the capacity for renewal and faunic habitats (comprising soil and water conservation). As well, they included the reduction of pollutants that are a factor in the decline in forests, the prevention of the irreversible degradation of forests, and the reiteration of the role that forests play in planetary ecological cycles (Maini 1993, 1994).

We must accentuate our efforts, be completely proactive, for such criteria to be adopted worldwide. We must take the necessary steps immediately to ensure the "ecological sustainability" of our industry. In the not too distant future, international markets could well be closed to forestry products that do not respect these criteria. The forestry industry is at a crossroads. By applying intervention norms that favour a multiple use of the forest, it has the possibility of becoming the champion for sustainable development. The forestry industry must understand that the sustainable management and development of boreal and temperate forests is not just a concept, but a reality upon which our ecological and economic survival depends.

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Canadian biodiversity initiatives and successes

__Global biodiversity__ is pleased to present examples of Canadian initiatives and successes in studying, conserving, sustainably using, or communicating about biodiversity in Canada or overseas. The role of this is twofold. First, to show that in spite of the many threats to biodiversity, some innovative and worthwhile projects are being undertaken to learn about, protect, and wisely use biodiversity. Second, the examples are intended to provide models for people in Canada and elsewhere to follow, adapt, or enhance. We have tried to provide a contact person for each example. We hope these success stories will provide some light and encouragement amidst the encircling gloom. [D.E.M.]

Watch for more success stories in the next issue of *Global Biodiversity.*

✓ The Biodiversity Convention Office, Environment Canada

CONTACT: *Mr. John Herity, Director, Biodiversity Convention Office, Canadian Wildlife Service, Environment Canada, Ottawa, Canada, K1A 0H3. Tel: (613) 953-4374, Fax: (613) 953-1765.*

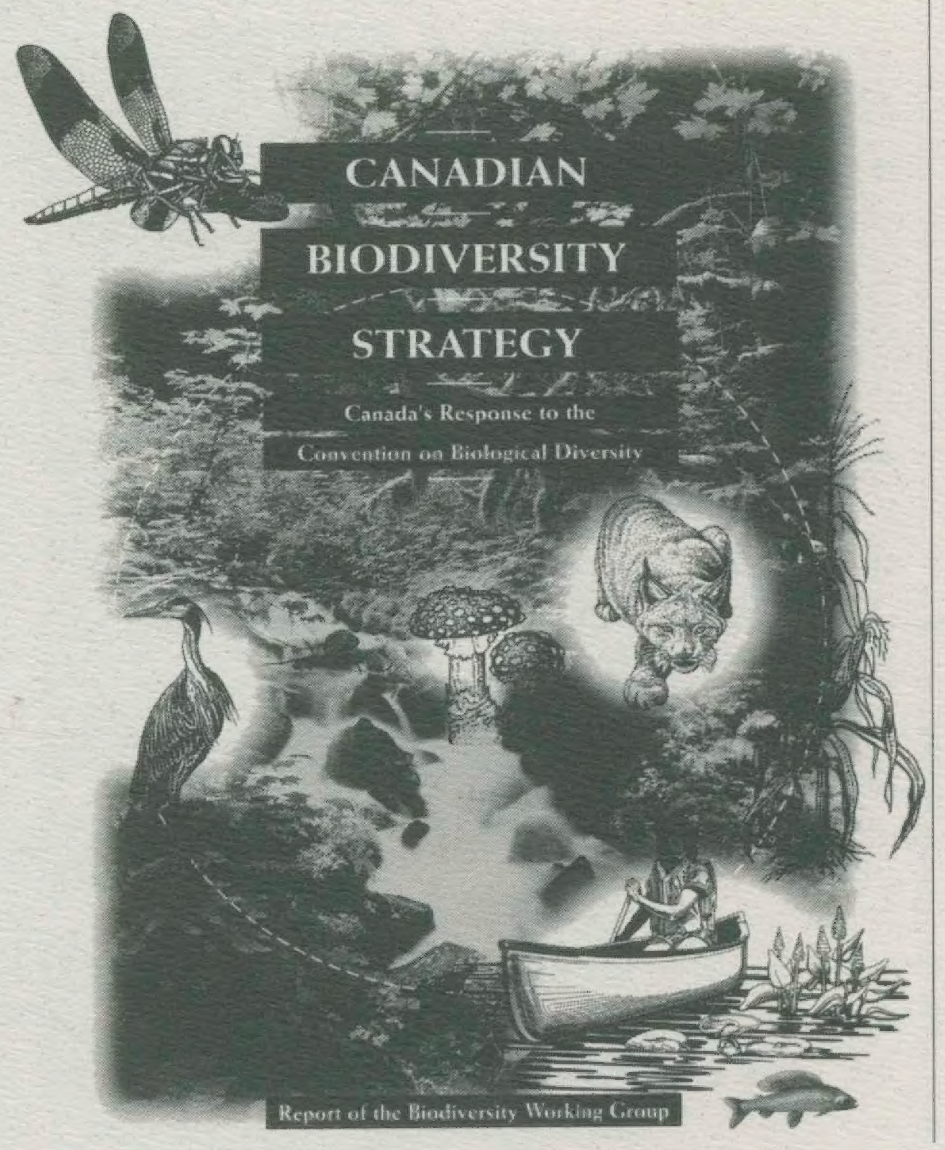
The Biodiversity Convention Office (BCO) was established in Environment Canada in mid-1991 to co-ordinate Canadian involvement in the negotiations for the United Nations Convention on Biological Diversity. With signature of the Convention at Rio in June 1992, it assumed responsibility for co-ordinating Canada's Convention follow-up activities.

SUCCESSES: During negotiations on the Convention, BCO organized and led consultations within the federal government and with provincial and territorial governments, environmental groups, and representatives of youth, labour, industry, and indigenous people. These consultations enabled the development of solidly-based Canadian negotiating positions and successful proposals to break deadlocks in negotiations and contributed to the development of broad national support for signing the Convention. The extensive consultations also contributed to national support for quick ratification of the Convention and for a national follow-up plan including development of a Canadian Biodiversity Strategy, a final draft of which was presented to Federal, Provincial and Territorial Environment Ministers in November 1994.

CURRENT CHALLENGES

BCO's current challenges can be described under three main headings:

1) Domestic follow-up: The BCO is finalizing negotiations on the Canadian Biodiversity Strategy, with a view to obtaining final approval within each jurisdiction by Spring 1995. The strategy was developed by a partnership of the federal, provincial, and territorial governments, in consultation with stakeholders. To



CANADIAN
BIODIVERSITY
STRATEGY
Canada's Response to the Convention on Biological Diversity

Report of the Biodiversity Working Group ensure indigenous people are involved, the BCO is working with the Assembly of First Nations amongst others to develop a follow-up strategy specifically for indigenous people. Further cooperation with indigenous people will be an important part of the BCO's work over the next two years.

The next phase of activity will be particularly challenging. The development of national actions in support of the strategy will require coordinated efforts both within and among jurisdictions as well as between government and non-government interests.

2) International Activities: Canada is expected to continue to play an active role in global efforts to ensure implementation of the Convention. BCO's role will be to coordinate the development of Canadian positions for the meetings of Conference of the Parties to the Convention and other expert forums on key policy issues. It will also seek to use institutions like the United Nations Commission on Sustainable Development and the North American Commission for Environmental Cooperation (NACEC) to promote implementation of the Convention both regionally and globally.

3) Consultation/Awareness: The BCO is keen to promote a broader understanding of the Convention and its importance to global conservation of biological resources. In cooperation with partners and stakeholders, it will develop programs and approaches to help Canadians better understand the importance of biodiversity and how they can contribute to its conservation.

The BCO will also continue to seek the guidance and advice of stakeholders on the implementation of the Canadian Biodiversity Strategy.

✓ Centre for land and biological resource research, economic plants and fungi/gene resources of Canada

CONTACT: *Program Chair, B.R.D., C.L.B.R.R., Research Branch, Agriculture Canada, K.W. Neatby Building, C.E.F., Ottawa, Ontario, K1A 0C6, Tel: (613) 995-5011, Fax: (613) 995-7283.*

INITIATIVES: At the level of Canadian native floristic biodiversity, recent accomplishments include a book on native ferns and fern allies, a guide to the grasses of Ontario, a flora of the Yukon (ready for publication), various contributions to the flora of Northern Quebec, a computerized treatment of poisonous plants, and numerous treatments of groups of interest, particularly on sedges (*Carex*, including a major review of hybridization), grasses (*Triticeae* and others), rushes (*Juncus*), and various aquatic plants. Recent monographs on economic groups have been published on oats (*Avena*), barley (*Hordeum*), weeds, marijuana (*Cannabis*), and works are in progress on honey plants, weedy panic grasses, and strawberries (*Fragaria*).

Several contributions to the cooperative projects of *Manual of North American Grasses* and *Flora of North America* are ongoing. From the point of view of research on germplasm biodiversity, tens of thousands of accessions have been added to Canada's national germplasm repository, the Gene Resources of Canada, which now houses more than 100,000 seed stocks. Laboratories have been established for genetic and taxonomic investigations, including the use of isozyme and DNA analysis. These have been useful in elucidating biodiversity at several taxonomic levels from the race to the family, particularly in such high-profile crops as alfalfa (*Medicago*), barley (*Hordeum*), rape (*Brassica*), bluegrass (*Poa*), and fescue (*Festuca*).

At the level of ecosystem biodiversiy, several areas of Canada have received special floristic attention in recent years, including Riding Mountain National Park, the Rideau Canal system, and Ontario alvars. Herbarium vouchers documenting all this biodiversity now amounts to over 800,000 vascular plant collections. Library facilities in botany for the examination of biodiversity are substantial, with more than 13,000 books.

Ongoing research in Canadian fungal biodiversity involves taxonomic and phylogenetic studies of plant disease and allergenic fungi, mycotoxigenic moulds, mycorrhizal fungi, wood decay fungi, biocontrol agents, zoosporic fungi, and mushrooms. Monographs, inventories, taxonomic revisions, and databases

Art courtesy of Linn Tarn

Eriothrix penitalis

Cleonice bigelowi

Dufouria americana

Leskia similis

These Tachinid heads demonstrate the difficulty of identifying taxonomic differences, even at a generic level. Such detailed differences as seen in the facial bristles are key identification traits. Reproduced from Agriculture and Agri-Food Canada's publication Manual of Nearctic Diptera, Vol.2, 1987 (ISBN 0-660-12125) by permission of Minister of Public Works/Government Services Canada, 1995

undertaken are all focused on agricultural and environmental problems. The National Mycological Herbarium (300,000 fungi) and the Canadian Collection of Fungal Living Cultures (12,000 strains) serve as research tools to scientists from Canada and other countries. Recent major accomplishments include Compendium of Plant Disease and Decay Fungi in Canada 1960-1980, An Annotated List of the Published Names in *Mycosphaerella* and *Sphaerella* (fungal plant pathogens), taxonomic revisions of *Trichoderma* sections (biocontrol agents), Ecology, Distribution and Systematics of the lignicolous corticioid fungi (*Basidiomycetes*) of Canada and the United States, Inventory of VAM fungi from Maritimes and Eastern Canada (mycorrhizal fungi, *Glomus, Acaulospora, Gigaspora*), Monograph of *Phaeocollybia* of Western Canada (saprophytic fungi), and systematic studies of Pythium species complexes (crop disease fungi). Other major initiatives nearing completion are a host index of the occurrence of plant disease and decay organisms, a catalogue for the Culture Collection, databases of the mushroom species of North America and Canadian VAM fungi. Ongoing taxonomic studies concern the preparation of an Identification Guide to Canadian Fleshy Fungi, databases on the pathogen *Colletotrichum*, and inventories of VAM fungi from Great Lakes area.

✔ Centre for land and biological resource research, systematic entomology programs

CONTACT: *Program Chair, B.R.D., C.L.B.R.R., Research Branch, Agriculture Canada, K.W. Neatby Building, C.E.F., Ottawa, Ontario, K1A 0C6, Tel: (613) 995-5011, Fax: (613) 995-7283.*

INITIATIVES: The Systematic Entomology Programs at BRD compromise 21 research scientists, 12 Honorary Research Associates, and 34 support staff responsible for conducting research on insects, mites, and spiders of importance to Canada. Current studies include systematic treatments of various plant-feeders (aphids, leaf hoppers, lygus bugs, sawflies, leaf beetles, cutworms, leaf-tying moths, phytophagous mites), animal pests (black flies, ticks), parasites and parasitoids (tachinid flies, various parasitic wasps), predators (empidid flies, carabid and rove beetles, predaceous mites), and bioindicators of the quality of soil and water habitats (soil and water mites, aquatic midges). The studies employ diverse analytical approaches including comparative morphology, morphometrics, cladistics, and molecular techniques. Recent examples of products of this research, in addition to numerous contributions to the primary scientific literature, are the popular handbook series *The Insects and Arachnids of Canada* and the award-winning three volumes of the *Manual of Nearctic Diptera*.

Research priorities are determined largely by the needs of the agriculture and forestry sectors, but generally, the results have wide application in other areas of ecology and resource management. This is reflected in the broad range of clients who use the National Identification Service offered by BRD and who regularly consult with BRD staff when planning or interpreting the results of their own research conducted in federal or provincial laboratories, universities, and the private sector. BRD scientists were major contributors to the volume "Canada and its Insect Fauna" published by the Biological Survey of Canada (Terrestrial Arthropods), the first census of insect and arachnid biodiversity in Canada. They are frequently invited to contribute chapters to general works on the classification, faunistics, and ecology of insects and arachnids in North America and worldwide. BRD staff have conducted preliminary surveys of insect and arachnid biodiversity in several National Parks through contracts with Parks Canada.

The research and service capabilities at BRD depend ultimately on the resources in the Canadian National Collection of Insects and Arachnids (CNC) and the Entomology Library of Agriculture Canada. The CNC is one of the three largest collections of insects and arachnids in the world, containing nearly 14 million curated specimens. It is a fundamentally important source of scientific data, and the extensive holdings of valuable type and voucher specimens represent a significant national treasure. Because arthropods are the dominant organisms in terms of variety and abundance in most terrestrial and freshwater ecosystems, the CNC is arguably the single most important source of information on biodiversity in Canada. The Entomology Library is the most comprehensive source of primary literature on insect and arachnid biodiversity in Canada, and it is constantly updating and improving its holdings in systematics and related disciplines.

✓ Ecologically responsible forest use in British Columbia

CONTACT: *Doug Patterson, Ecoforestry Institute Society, P.O. Box 5783, Station B, Victoria, B.C. V8R 6S8 Tel: (604) 598-2363, Fax: (604) 598-2365*

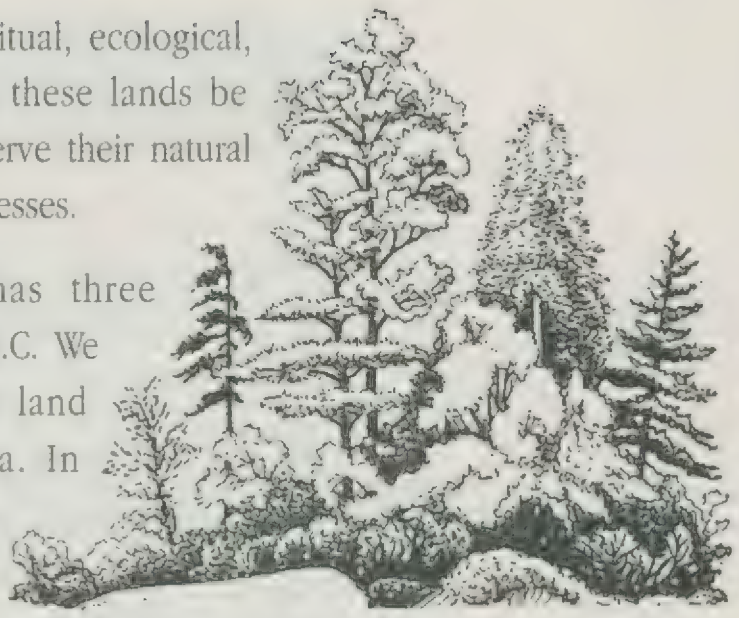
INITIATIVES: The Ecoforestry Institute Society seeks to educate and train ecoforesters so that they have the knowledge, skills, and the wisdom to maintain and restore healthy, diverse forests with an abundance and variety of values and goods. When sustainably harvested, these forests can provide dignified work in perpetuity and provide a foundation for sustainable rural communities. We also seek to establish demonstration forests where the general public can see through their own eyes a healthy forest where ecologically sound forestry is being practised and researched.

Ecoforestry is an ecological alternative to current industrial forestry practices. Industrial forestry has a long history of destruction of natural forest ecosystems: top soil, water quality, biological diversity, and habitat provided by healthy forests. We wish to make the public more aware that there are alternatives to the destruction of forests through clearcutting and high-grading. Ecoforestry allows for the protection of ancient forests while harvesting goods to meet vital human needs.

Ecologically responsible forestry rests on the basic principle that Nature knows best how to grow healthy forests. Sound ecoforestry practices are in harmony with natural processes of the forest. Ecoforestry employs section logging techniques when it has been determined that tree removal will be conducted within a forest. The volume of removal is based on what the forest naturally produces. In most cases, where ecoforestry is practised, the total biomass and solar conversion process of a forest continues to increase. The structural and genetic diversity and richness of the forest are maintained and evolve through natural processes.

Ecoforestry is a comprehensive community-ecosystem approach that recognizes that natural forests provide a variety of intrinsic and instrumental values and goods: environmental, productive, recreational, aesthetic, and spiritual.

The Ecoforestry Institute Society recognizes that the remaining ancient forests should be preserved, while other forests could provide goods to be sustainably harvested for human needs. However, the Ecoforestry Institute holds that moral, spiritual, ecological, and other values require that these lands be carefully entered so as to preserve their natural ecological and evolutionary processes.



The Ecoforestry Institute has three demonstration sites located in B.C. We are seeking agreements with land owners elsewhere in Canada. In addition, we have organized a Working Group of ecoforesters from B.C., Washington, Oregon, and California to come to a consensus on ecoforestry principles and practices. We are actively involved in the growing movement towards certification of sustainable forest practices and products. We will be certifying ecologically responsible forest use and products by summer 1995 at three pilot projects located throughout B.C. We expect to begin general certification at the same time. Finally, we will begin the second Ecoforester training course in summer 1995 based in Oregon and Victoria.

✓ Gene banking of Pacific salmon stocks in B.C. aboriginal territories

CONTACT: *Dr. Brian Harvey, Executive Director, International Fisheries Gene Bank, (IFGB), c/o Vancouver Aquarium, P.O. Box 3232, Vancouver, B.C., V6B 3XB Tel: (604) 598-6019, Fax: (604) 598-2047*

INITIATIVE: The IFGB is a non-governmental organization whose mission is to counterbalance the loss of wild fisheries' genetic resources through a system of regional and national fish gene banks. Using proven systems for conservation of plant genetic resources as a model, the IFGB coordinates the collection, storage, and dissemination of germplasm from stocks and species threatened by overfishing and habitat loss, as well as from stocks with potential value in fish culture. As with plant gene banking, the IFGB concentrates on species with economic and social value as food.

Like plant seed banks, the IFGB operates to provide a genetic "insurance policy" against further loss of species diversity, and its holdings can be used at any later date to introduce irreplaceable wild genetic resources into national breeding programs.

The IFGB is active in British Columbia (B.C.) as well as internationally; overseas projects include collection of genetic material and training in Colombia and Venezuela (target fish: *Colossoma*, widely farmed in Latin America and Asia); and collection of carp genetic resources below the proposed site of the Three Gorges dam on the Yangtze River in China.

In B.C., IFGB is currently collaborating with the Shuswap Nation to collect and bank genetic material from selected weak Pacific salmon stocks in Shuswap traditional territories. The projects include training of Native workers in gene banking procedures, as well as establishment of regional gene banking facilities.

Together with the Shuswap Nation, IFGB is working to expand the regional gene banking network in B.C. to provide access to valuable and often threatened genetic material for future enhancement efforts.

✓ Maritime fishermen's union, clean ocean committee

CONTACT: *Ishbel Butler, Maritime Fishermen's Union, R.R. #5, New Glasgow, N.S. B2H 5C8, Telephone: (902) 922-3314, Fax: (902) 922-2283*

"The beaches are looking so much better since the start of the *Ship to Shore Campaign*," says Mary Wallace, a Chance Harbour, Nova Scotia resident. "It's so nice to see seaweed washing up instead of garbage."

One reason for the beaches' improved condition is the fact that the Maritime Fishermen's Union *Ship to Shore Trash Campaign* is working. Each Maritime wharf surveyed collected an average of 1.5 tons of garbage per year, and along with the southwestern shore of New Brunswick, an average of 9,500 kg of garbage is brought ashore each week.

But the campaign is far from over. Last year the campaign was expanded to reach recreational boaters, who are also part of the problem. Recreational boaters dump over 100,000 tons of garbage into the world's oceans each year. The campaign is also extended to reach sport fishers. If the average angler cuts loose only one yard of line per trip, it is estimated the potential amount of deadly monofilament line would be enough to circle the globe. Beach goers are also encouraged to do their part by properly disposing of their own garbage.

Trash in the ocean does more than just litter beaches: it kills marine life. Plastic, the most common form of trash dumped into the ocean, is also the deadliest. Six-pack rings strangle fish and birds, turtles die when their digestive tract is clogged by plastic that looks like jellyfish, their favourite food, and birds feed bits of plastic to their young, who choke on it and often die.

In addition to plastic, discarded fishing equipment is especially dangerous. Old nets and traps compete with fishers as they go on ghost fishing for years, resulting in lost potential for the fishing industry.

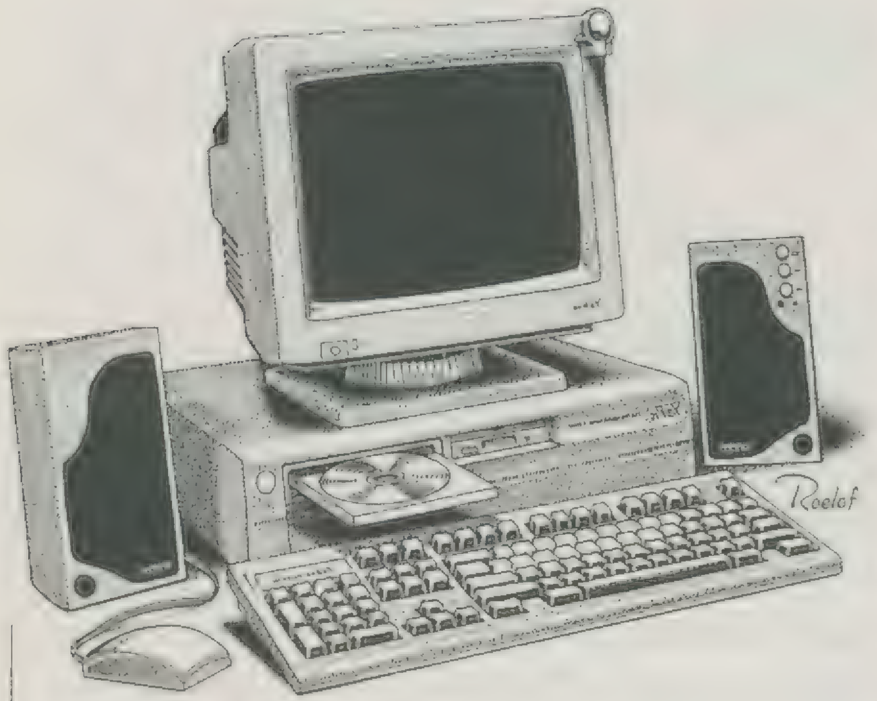
"We're pleased with how many fishers have climbed aboard the campaign and hope that the recreational boaters and sport fishers will join us in keeping our ocean healthy and clean," said Ishbel Butler, director of the program.

✓ Conservation data centres

CONTACT: *Rebecca Goodwin, National Projects Director, Nature Conservancy of Canada, 110 Eglinton Avenue West, 4th Floor, Toronto, ON M4R 2G5, Tel: (416) 932-3202, Fax: (416) 932-3208.*

INITIATIVES: The Nature Conservancy of Canada has embarked on an ambitious program to gather the information so urgently needed to protect Canada's natural diversity. Today the information is scattered among thousands of reports, universities, research centres, and in the minds of countless experts.

Conservation Data Centres are being established across Canada to provide a dynamic and ongoing institutionalized memory bank of selected biological data. Information about the status and distribution of rare or endangered species, many common species, natural communities, and other special biological features in a province are collected and stored in our centralized data management system. Map, manual, and computer files keep the information organized and easily accessible. Records are indexed by many parameters including standardized name, location, status, watershed, administrative districts, and land ownership. All data centres employ standardized methods of identical terminology to process information about natural elements. This enables interprovincial and international sharing in the exchange of data, as well as summarizing range-wide information on species.



Conservation Data Centre technology is being provided by the U.S. Conservancy under contract with The Nature Conservancy of Canada. The computer software is now in its sixth generation and is based on Advance Revelation, a relational database software package that is extremely powerful and flexible, yet highly menu driven. The specially designed, tailored applications package is constantly undergoing review, testing, and improvement by The Nature Conservancy. Major upgrades are released annually, with minor upgrades distributed throughout the year. This state of the art technology is now being used in all 50 U.S. states and a growing number of Latin American nations.

Conservation Data Centres are now established in Quebec, Ontario, Manitoba, Saskatchewan, and British Columbia. Almost $3,000,000 has been committed to the establishment of the Centres since 1988. The Nature Conservancy has developed partnerships with provincial government agencies, corporations, foundations, provincial conservation organizations, and the Canadian Wildlife Service to demonstrate the effectiveness of data centres. Following a two-year pilot program, Centres are funded by provincial governments.

In addition to provincial governments, partners leading the development of Conservation Data Centres include The Quebec Society for the Protection of Birds, Fondation de la Faune du Québec, The Ontario Natural Heritage League, The Ontario Heritage Foundation, The Richard Ivey Foundation, SaskPower, Saskoil, The Vancouver Foundation, The British Columbia Nature Trust, and the Canadian Wildlife Service.

✓ The Pembina Institute for appropriate development

CONTACT: *The Pembina Institute For Appropriate Development, P.O. Box 7558, Drayton Valley, Alberta, Canada T0E 0M0, Tel: (403) 542-6272, Fax: (403) 542-6464.*

INITIATIVE: The Pembina Institute for Appropriate Development, formed in 1984, has as its mandate the support and encouragement of formal education about environmental and global issues, and the research, development, and promotion of public awareness of policies and programmes that lead to environmental protection, resource conservation, and environmentally sound and sustainable resource management and development.

Environmental education is achieved through various means at the Pembina Institute. It conducts professional development sessions and presentations for teachers, provides curricular materials for schools, and offers community adult environmental education courses. The Institute also publishes The Canadian Environmental Education Catalogue, a national cataloguing service of environmental education resources for educators.

The Institute's research and policy work is concentrated primarily in the area of air quality issues, environmentally sound energy development and management, and environmental economy linkages. Some recent activities include active participation in the federal government's process to develop a national action plan for achieving Canada's climate change commitments and participating on the Board of the Alberta Clean Air Strategic Alliance (a provisional, public agency responsible for strategic air quality planning and issue management in Alberta). The Institute also provides environmental consulting to a wide range of clients from the private and public sectors. Projects include developing and reviewing corporate environmental strategies, advising on the environmental impacts of various development activities, and designing and facilitating employee awareness and education programmes.

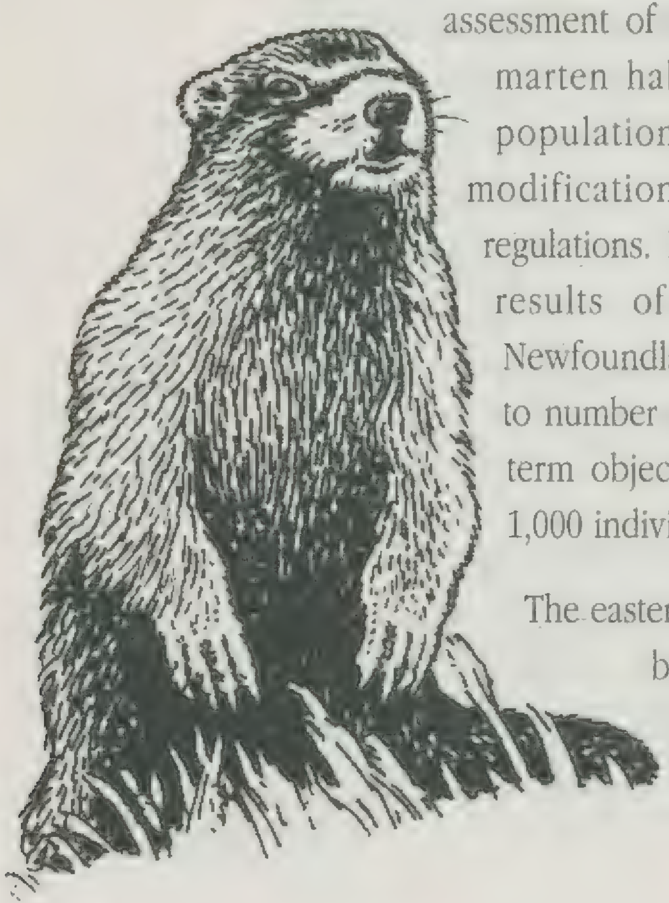
In keeping with its mandate for keeping the public informed, The Pembina Institute provides various information and networking services. The Alberta Environmental Directory, Environment Network News, and The Canadian Environmental Educator's Directory are among these services.

Finally, The Pembina Institute has many community outreach programs. Some successes have been the sponsoring and management of the Drayton Valley area recycling centre; co-chairing the Alberta Ecotrust Foundation; and participation in the Drayton Valley Municipal Environmental Advisory Board. As well, the Institute provides information to members of the local community who have concerns and questions about environmental protection and resource management.

Endangered species recovery plans

CONTACT: *RENEW Secretariat, c/o S. Normand, Endangered Species Conservation Division, Canadian Wildlife Service, Place Vincent Massey, 351 St-Joseph Blvd. Hull, QC, K1A 0H3 Tel: (819) 997-4991, Fax: (819) 953-6283*

INITIATIVE: RENEW (Recovery of Nationally Endangered Wildlife) gave final approval to four recovery plans in 1994. Plans for the Newfoundland Marten, the eastern population of the Harlequin duck, Henslow's Sparrow, and the Vancouver Island Marmot list actions required to bring these species back from the brink of extinction. This brings to 15 the number of officially approved plans, and to 22 the number of species that are the object of recovery actions.



The Newfoundland Marten is threatened by the logging of old-growth forest, a naturally impoverished prey base, and accidental capture in snares set for hares. The recovery plan calls for multiple actions, including the establishment of marten reserves and management assessment of the quality and quantity of future marten habitat, the monitoring of marten populations at regular intervals, and the modification of the snaring and trapping regulations. Based on known densities and the results of habitat supply analysis, the Newfoundland Marten population is believed to number less than 300 individuals. The long-term objective is to bring that population to 1,000 individuals by the year 2060.

The eastern population of the Harlequin Duck breeds in northern Quebec, Labrador, insular Newfoundland, and the Gaspé peninsula, and winters on the Atlantic coast from Newfoundland to Virginia, although most winter in Penobscot Bay, Maine. The eastern Harlequin Duck nests in low densities along fast-flowing mountain rivers and streams in relatively undisturbed low Arctic wilderness habitat. Its population is estimated at less than 1,000 individuals. Factors threatening this population are habitat loss due to hydroelectric developments, disturbance from military low-level flying, habitat degradation from forestry and resource extraction industries, increased disturbance from adventure tourism, incidental harvest by native peoples, illegal hunting, oil pollution, and habitat degradation from the effects of fishing and seaweed harvesting activity. The goal of the recovery plan is to rebuild the population to a more secure level of at least 3,000 individuals by the year 2010.

Of the four species for which a recovery plan was approved in 1994, the Henslow Sparrow is the closest to the brink of extirpation in Canada. The species is no longer common anywhere in North America because of the disappearance of native grasslands and conversion of man-made pastures to cropland or forests. The loss of wintering habitat could also explain the decline. The plan calls for, among other strategies, the determination of the causes of the species decline, identification of habitat requirements, and availability of the breeding and wintering grounds, and the protection and management of the breeding habitat.

The Vancouver Island marmot is the only endemic mammal of Canada that has been listed as "endangered." This gregarious rodent is the rarest of the six species of marmot in North America. Its rarity is due to the restricted surface covered by its preferred habitat which makes it vulnerable to habitat loss through land development or other human activities. The goal of the recovery plan is to increase the population to between 400 and 600 individuals so that the species can be downlisted to "threatened." The goal should be achieved through the identification of unused suitable habitats on the island, followed by the transplanting of marmots in these areas. The establishment of new subpopulations will make the species less vulnerable to catastrophic events.

RENEW is a committee composed of members from the Federal, Provincial and Territorial governments and three national NGOs. Its national objective is to reintroduce extirpated terrestrial vertebrate species where possible, and to approve recovery plans for those listed by COSEWIC (Committee on the Status of Endangered Wildlife in Canada) as endangered or threatened.

✓ Saskatchewan protected area study initiatives

CONTACT: *Policy and Planning Unit, Policy and Public Involvement Branch, Department of Environment and Resource Management, 3211 Albert Street, Regina, Saskatchewan, S4S 5W6, Tel: (306) 787-0414, Fax: (306) 787-0024.*

INTERAGENCY NATURAL EFFORT

Saskatchewan Environment and Resource Management (SERM) has assumed the lead role in undertaking a Protected Areas Study, with the endorsement of the Saskatchewan Round Table on the Environment and Economy. A Protected Areas Task Force was formed in 1992 to respond to the recommendations made by the Round Table in the Conservation Strategy for Sustainable Development in Saskatchewan (1992), specifically to "complete and maintain a comprehensive system of protected areas to maintain the biological diversity of Saskatchewan." This initiative entails the completion of a protected areas system plan by the year 2000, ensuring that at least one protected area from each of the province's ecoregions is represented. The importance of producing such a strategy has been restated in Saskatchewan's *Environmental Agenda: Securing a Sustainable Future* (SERM, 1994).

Currently, the Protected Areas Task Force serves as a coordinating committee for the Protected Areas Study. It is comprised of representatives from various government departments, as well as a member from the University of Regina and the Saskatchewan Conservation Data Centre. A number of initiatives have been completed in support of this study and are briefly described below.

PROTECTED AREAS INVENTORY AND MAPPING PROGRESS

A computerized inventory of land designations in the province protected to some degree has been completed. This inventory includes land designations under provincial, federal, and municipal control. Over 700 protected areas were identified and entered directly into the Saskatchewan Conservation Data Centre's Biological Conservation Data (BCD) System—managed Area Basic Record (MABR) File. The boundaries have been drawn on 1:50,000 topographic maps (located in the Saskatchewan Conservation Data Centre) for the majority of protected areas in the database.

Other protected areas, such as Wildlife Habitat Protection Lands and Wildlife Development Fund Lands have not yet been entered into the BCD System—MABR File. Instead, they are contained in two separate SERM databases. The former contains approximately 30,000 quarter sections (64 ha), while the latter holds 919 quarter sections of land. The Department of Geography, University of Regina has been contracted to produce a digital and hard copy map of protected areas in Saskatchewan. This product is near completion.

STATISTICAL REPORT

The Protected Areas in Saskatchewan: A Statistical Report was published by SERM in 1993. The report meets several major objectives of the Protected Areas Study, namely, to produce a computerized inventory of protected areas in Saskatchewan, and to use this inventory as a basis for calculating the proportion of the province that is protected. It outlines the methodology used in the report, provides a listing of land designations in the province and their associated attributes, such as ecoregion location, year designated, and designation purpose. Another section assesses the current level of protection provincially and by ecoregion through the use of the aforementioned combined databases. The current system of protected areas (as of December 1993), allowing for overlapping designations, protects approximately 6.45% of Saskatchewan's total area.

ECOLOGICAL LAND CLASSIFICATION (ELC) SYSTEM

In 1992, the Ecological Land Classification (ELC) System Committee at the request of the Protected Areas Task Force began reviewing existing ecological land classification systems used in Saskatchewan and across the country. Committee membership was comprised of provincial and federal government agencies, non-government organizations, and the University of Regina. Their aim was to develop a new land classification system that would be: a) consistent across jurisdictional boundaries; and b) used by various groups (e.g. government agencies, NGOS, educators, etc.). At the same time, the federal departments of Agriculture and Agri-Food Canada and Environment Canada were pursuing this same objective on a nation-wide scale. Both groups combined their forces in order to achieve their common goal of producing an acceptable standardized ELC system. Their efforts have resulted in the development of two products: the Terrestrial Ecozones and Ecoregions of Canada Map and an Ecoregions of Saskatchewan Map.

Saskatchewan has adopted the ELC system, which divides the province into 4 Ecozones, 11 Ecoregions, and 157

Landscape Areas based on soil type, climate, and vegetation zones throughout the province. The Ecoregions of Saskatchewan Map provides an essential framework for ecosystem based decision-making. It is already being used to fulfil a wide variety of actions listed in Saskatchewan's *Environmental Agenda: Securing a Sustainable Future* (SERM, 1994). For example, the protected areas strategy will use this ecoregion framework to identify gaps in the existing protected areas system for the province. The ecological framework will also form the basic reporting structure for state of the environment reporting.

Finally, the ELC System Committee is in the process of preparing a supporting technical document for the Ecoregions of Saskatchewan Map. This product should be available in June of 1995.

LANDSCAPE CONSERVATION

The province designated its third ecological reserve and fourth provincial wilderness park during June 1994. Buffalograss Ecological Reserve preserves a 15.42 ha portion of the Moist Mixed Grassland Ecoregion in southeastern Saskatchewan, as well as protects the best known Saskatchewan population of buffalograss, a provincially endangered plant species. Clarence-Steepbank Lakes Wilderness Provincial Park adds another 17,549 ha to the provincial park system. This park is representative of the Mid-Boreal Upland Ecoregion and allows for the pursuit of low intensity and non-mechanized Wilderness recreation.

SASKATCHEWAN CONSERVATION DATA CENTRE ACTIVITIES

As of November 1994, the BCD System contained 2,083 element occurrence records, 3,520 element tracking records, 8,612 source abstract records, 546 element provincial ranking forms and 746 managed area basic records.

During 1994, the Centre responded to over 260 requests for database information. Requests included projects involving commercial, residential, and governmental development; environmental impact assessments; and land acquisitions by nongovernment organizations.

Field inventory work was conducted in Moose Mountain and Meadow Lake Provincial Parks during the past summer. This information is being incorporated in the vegetation management plans for the two provincial parks.

Additional studies conducted over the past year included: participation in a Provincial Great Blue Heron Study; involvement in 130 ha site inventory and management plan for Hidden Valley Nature Reserve owned by the Regina Natural History Society; a co-operative provincial study with Wildlife Branch, SERM on land ownership in and around ferruginous hawks' nests; involvement with Nature Saskatchewan's Burrowing Owls program (i.e. site location, status, and land ownership of burrows); and, a sage grouse survey of leks in the southern part of the province. The Centre is also actively involved in the Biodiversity of Agricultural Saskatchewan, a co-operative project with Wildlife Branch, SERM, and the Department of Geography, University of Regina in the identification and bio-inventory of native grasslands.

PROTECTED AREA PLANNING

A broad protected areas strategic plan outlining the conservation goals for the province will be completed in 1995. As part of this effort, SERM's existing Provincial Park System Plan will be reviewed and updated, as well a position paper on the province's Representative Areas Network will be published.

The position paper will outline the rationale for, and the process whereby, a provincial Representative Areas Network will be completed by the year 2000 in addition to ongoing park and ecological reserves designations. Representative Areas will be of two types, corresponding to the Coarse Filter/Fine Filter approach. Each of the 11 Ecoregions will have at least one large Representative Area that captures the landscape component of biodiversity. In addition, there will be a larger number of smaller Representative Areas throughout all 157 Landscape Areas of the 11 Ecoregions that capture the species/genetic component. In total, the network will contain viable representation of all the province's biological diversity.

Already existing Representative Areas will be assessed for size, isolation, ecological integrity, biological representation, and threats before inclusion into the network. Where possible, new areas will be designed by applying principles of island biogeography, ecological succession, and ecological disturbance. For example, consideration of succession, fire cycle, and old growth indicators suggests that landscape Representative Areas in the southern boreal forest should be at least 200,000 ha in size in order to capture biodiversity components. In conjunction with the design of the network, work will also be conducted in order to derive management plans for the continued long-term maintenance of native biodiversity within the network.

PUBLICATIONS AVAILABLE

The following publications directly related to protected areas and the ELC System efforts may be obtained from SERM: *Ecoregions of Saskatchewan Map; A Report to the Protected Areas Task Force on Ecological Land Classifications in Saskatchewan* (Ecological Land Classification Subcommittee, November 1993) and *Protected Areas in Saskatchewan: A Statistical Report* (Lawton and Hickie, 1993). The latter 163-page document is descriptive in nature and was intended to support further publication efforts by the department, such as a provincial policy and strategy document on protected areas.

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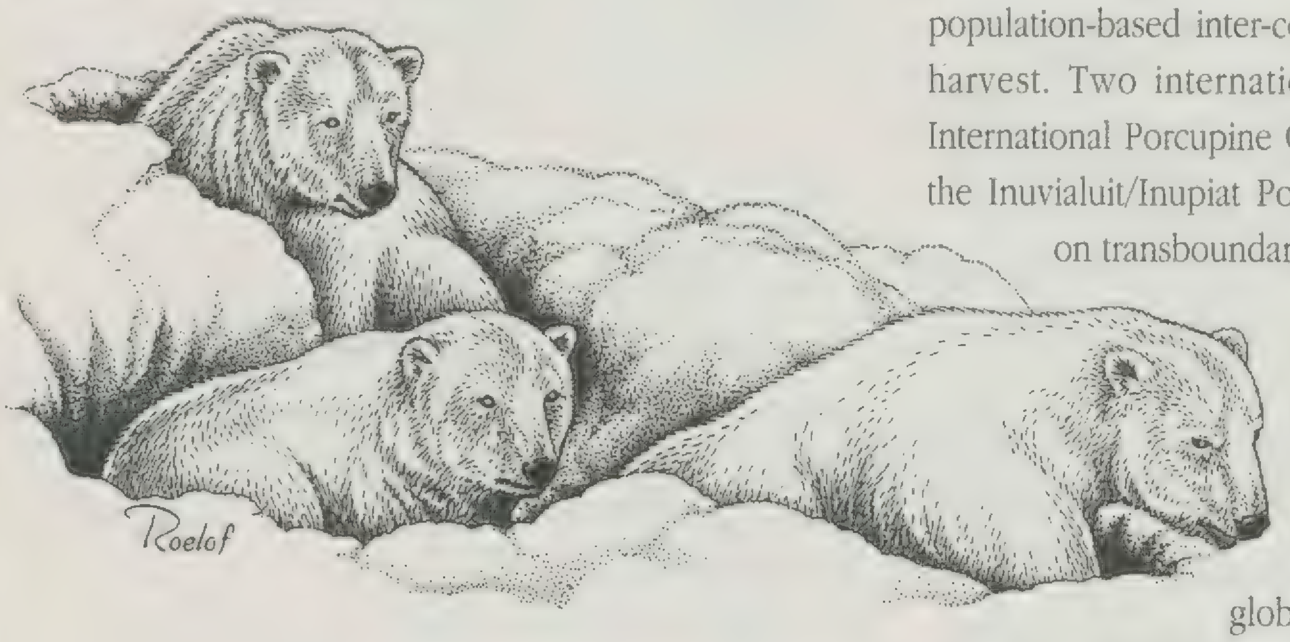

✔ Cooperative aboriginal & scientific wildlife management in the N.W.T.

CONTACT: *Wildlife Management Division, Department of Renewable Resources, Government of the Northwest Territories, Box 21, Scotia Centre (5th Floor), 600, 5102 - 50 Avenue, Yellowknife, NT, X1A 3S8, Tel: (403) 873-7411, Fax: (403) 873-0293.*

INITIATIVES: Aboriginal people in the Northwest Territories are intimately involved in management of wildlife resources through the mechanism of co-operative agreements. The Beverly-Qamanirjuak Caribou Management Board was set up in 1982 as a forum in which scientists, wildlife managers, and caribou users from the N.W.T., Manitoba, and Saskatchewan could produce jointly agreed measures to halt what then appeared to be a dramatic decline in the herd's numbers. The "B-Q Board" proved to be an effective forum for information flow, appreciation of differing viewpoints, and decision-making. It has become a model for effective consensus wildlife management. Wildlife management advisory boards have become a standard feature of land claim settlements. The Inuvialuit Final Agreement of 1984 set up the Wildlife Management Advisory Council to advise government on wildlife matters within the Inuvialuit Settlement Region. It has been effective in steering research and providing by-law quotas. Similar boards are integral to land claim agreements in process or settled by Gwich'in, Dene, and the Inuit. Polar bear co-management has evolved rapidly over the past few years with progress towards a comprehensive set of population-based inter-community agreements to govern harvest. Two international management boards, the International Porcupine Caribou Management Board, and the Inuvialuit/Inupiat Polar Bear Committee now advise on transboundary wildlife populations.

Editor's Note: For further inspiring success stories on a global level, consult *Success stories of women and the environment* edited by Waafas Ofosu-Amaah and Wendy Philleo (1992). Volume II. Proceedings of the Global Assembly of Women and the Environment, "Partners in Life." WorldWIDE Network, Inc., 1331 H Street, NW, Suite 903, Washington, D.C., U.S.A. 20005, Tel: (202) 347-1514, fax: (202) 347-1524. 296 pp.

Biodiversity and the recent International Conference on Population and Development

With the Earth's human population at 5.7 billion and growing at 95 million people a year, more poor people than ever before, and the remaining wild land shrinking and being fragmented, the Cairo Conference on Population and Development in September 1994 was most timely. Entrenched forces thwarted change on the international scene and hampered provision of resources to women, leaving it up to individual states to harmonize population, carrying capacity, and conservation of biodiversity. [D.E.M.]

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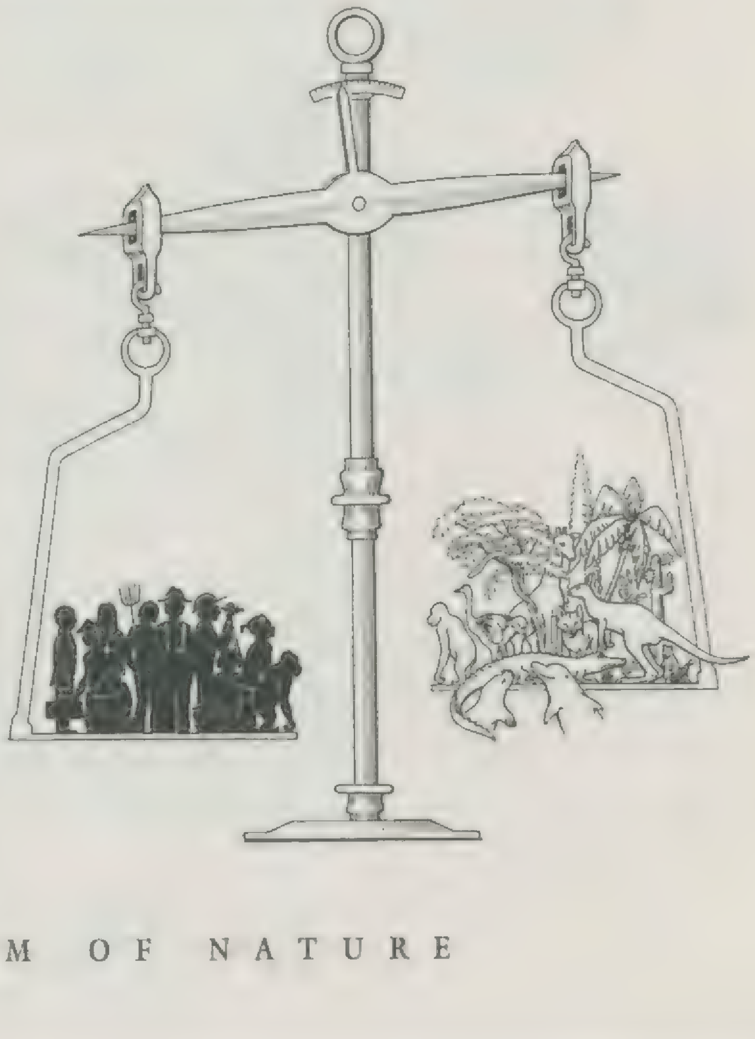
INTRODUCTION

Most extinctions today are no doubt caused by human activity. Some are due to over-harvesting, but most are due to the disruption of ecological niches by activities such as clearing land, which make the area uninhabitable for all, or nearly all, the original species. Land is cleared in the course of "development," a process that converts the natural world into a source of resources and a waste sink. Both resource demand and waste production are population dependent, though societies differ widely in per capita impact.

Currently, then, the major threat to biodiversity is the growth of human populations together with rising per capita consumption. The more of us there are, and the more "stuff" we want, the more of the production of the lands and waters we must divert to ourselves. Indeed, we take not only the production for our maintenance, but the land and the water themselves for our farms and cities. Few species can adapt to drastically modified or man-made landscapes, and the rest vanish with the niches to which they are tied by adaptive pressures. In Canada, nearly half of our known endangered and threatened biota are in the Great Lakes–St. Lawrence basin (Canada 1991), which occupies about 1.5 per cent of Canada's land-mass of nearly 10 million square kilometres. Not by chance, it also contains more than half our population of 29 million people (Canada 1994).

That is one reason why conservationists welcomed the International Conference on Population and Development (ICPD) held in Cairo in September 1994. Were we just naive, or did it make a difference?

It is in the nature of international agreements that they are negotiated. Often we think of negotiations as finding a middle-ground that all can accept. This is quite possible when all agree on the problem and all are trying to solve it. Sometimes people start from such widely differing perspectives that outcomes are simply deals with little or no relevance to the issue.



FIVE SCHOOLS OF THOUGHT

Analysis shows that there are five schools of thought on the population issue (Campbell 1993). The first, and the one I adhere to, wants to see a rapid reduction of the growth rate, or stabilization, or even reduction of global population in the interests of later generations, quality of life, and environmental quality. A second school of thought is the market preference community, which argues that population is not a problem, and if it is one, it will be solved, like everything else, by non-regulated market forces.

A third school of thought sees distribution as the fundamental problem. It says that all would be well if disparities of wealth were less; that consumption in rich countries has more impact than population growth in poor. A fourth school is that of women's groups, who support the distribution position and add concerns over coercive birth control programs and the status of women. A fifth and final school is represented by the Holy See, several Latin American and some Islamic countries where authoritarian fundamentalists rule. The most obvious concern of this school is sexual licence. It has also been characterized as "Patriarchy's Last Stand" (Dyer 1994).

The school of thought to which one belongs is largely predetermined by circumstances and culture. You will be less impressed about environmental values if you need a lot of children to scrounge water and fuel-wood than you might be if you have a job looking after elephants in an East African park. You will be more likely to blame northern over-consumption for resource depletion if you are pulling yourself out of poverty and looking for a place at the table, too. In brief, many people came to ICPD with their minds made up.

The event was fifth in a series of international population conferences. The first two (Rome, 1954; Belgrade, 1965) were technical meetings, but the next two (Bucharest, 1974; Mexico City, 1984) discussed policy issues and made recommendations. The scope of the discussions has become very broad, and now includes migration, status and health of women, infant and child mortality, the environment, poverty and underdevelopment, economic growth, resource depletion, consumption, and global equity.

The ICPD was planned in 1991. The first of a series of six expert group meetings was held early in 1992. The following subjects of these meetings were chosen as the most important for the conference:

Population, environment, and development
Population policies and programs
Population and women
Family planning, health, and family well-being
Population growth and demographic structure
Population distribution and migration

Later in the year and into 1993 a series of regional population conferences were held. A delegation from Canada participated in one held in Geneva. As the reports from these meetings were prepared, drafting of the final report was taking place at the conference secretariat, under the leadership of Dr. Nafis Sadik, Executive Director of the UN population agency and conference Secretary-General.

MEDIA COVERAGE

The draft report was then reviewed in a series of three preparatory committee meetings of national delegates, but with numerous non-governmental organizations also represented and having their own meetings and lobbying delegates. It was at the last of these, in April 1994, that the Holy See rejected many passages in the report referring to reproductive health, contraception, and abortion. The media eagerly followed the confrontation: of 60 newspaper headlines on the ICPD, it was mentioned in over a third. The final statement of the conference, the Programme of Action (United Nations 1994), was modified in accordance with these and other objections, and was adopted with very few delegations remaining opposed.

In the draft, the list of "Principles" includes the statement, "All States and all people shall cooperate in the essential tasks of eradicating poverty as an indispensable requirement for sustainable development." It also includes, "Economic development must be environmentally sound and sustainable." But the wealthy countries, those of the OECD, include only about one in six of the current total of 5.6 billion people. It is difficult to see how many more people can enjoy wealth without adding to already heavy strains on the environment.

There is one short section—less than 2 pages of 113—on "Population and environment," and it is weak and ambiguous. The third and strongest is, "Pressure on the environment may result from rapid population growth, distribution and migration, especially in ecologically vulnerable ecosystems. Urbanization and policies that do not recognize the need for rural development also create environmental problems."

Under "actions," there is only one clear environmental statement: "Modify unsustainable consumption and production patterns through economic, legislative and administrative measures, as appropriate, aimed at fostering sustainable resource use and preventing environmental degradation...."

There is little comfort in these vague and largely self-evident statements. But how effective was the conference in the crucial area of helping to stem the growth of human population, currently increasing by 86 million, or almost by another Mexico, annually? It had been reported that the ICPD would produce a plan to stabilize world population at 7.27 billion by the year 2050. We understand that the final draft was less ambitious, envisaging a goal "below" the UN's medium projection of 9.8 billion by 2050.

CONCLUSION

The achievements of the ICPD lie in the recognition that, coercive programs such as China's aside, demographic trends result from myriads of decisions at the individual level. Each such decision takes place in every kind of experiential, familial, economic, and cultural setting. In countries in which fertility (an estimate of the number of children each woman would bear in her lifetime) is high, some important factors include the ability of women to control their reproductive lives; the probability of their infants surviving to adulthood; the number of years of education, and places in the paid workforce available to women; and access to reproductive health services. Accordingly, the key recommendations of the conference address gender equality, including educational and employment equity, and basic health services. Those of us who see stabilization of world population as a paramount goal can only hope that working on these much broader issues will foster the decline in fertility now in progress almost everywhere, before the environment, on which we all rely, is irremediably degraded.

Perhaps the most significant product of the ICPD in this country is the storm of discussion on population issues it unleashed. Perhaps we will yet have fond memories of this conference as having hastened the day when political leaders, at all levels, face the costs as well as the benefits of Canada's population growth rate of 1.4 per cent (UN Population Fund, 1994), the highest among developed nations. Australia, which reportedly matched us until recently, is reducing immigration levels and has set up a legislative committee to hold hearings on the carrying capacity of the country. We should encourage our leaders to follow this wise example.

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Can a new *Melastome* help save "the prettiest island in the Pacific"?

The public often thinks that scientists know everything. But there are more unknown species than known species on the planet. And the geographic distributions of known species, especially in the South, are poorly known. Biological surveys are therefore very scientifically rewarding. They uncover treasures like unknown species, new range extensions, and new facts about life history or habits. When conducted with an indigenous person and a scientist, there is the chance of linking up scientific and "new" traditional ecological knowledge. Such expeditions can be hard work, but they can also be fun, rewarding, and spiritually renewing. [D.E.M.]

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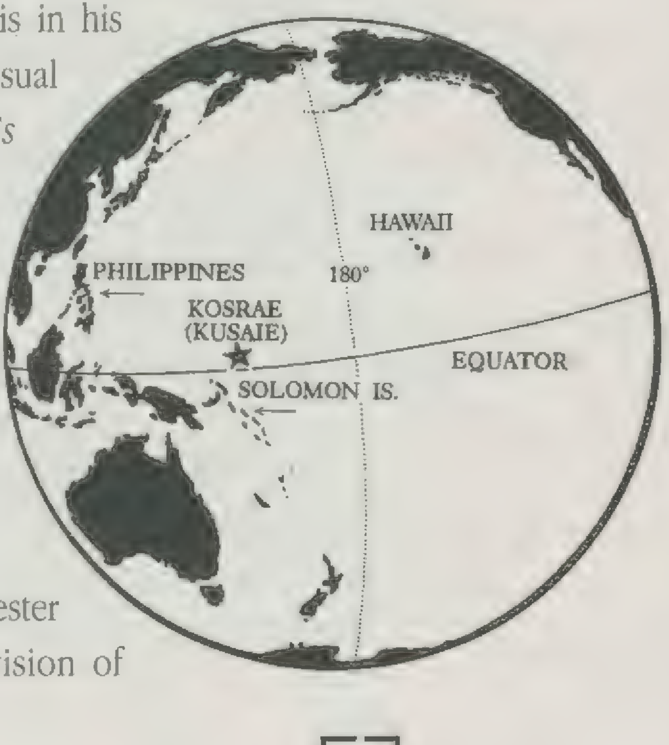
At the age of 85, Ray Fosberg had more than 66,300 botanic accessions to his name and was still counting when he died last year. I accompanied Fosberg, white-haired and feisty, when he returned to the Micronesian island of Kosrae in 1992 after an absence of nearly five decades. As a younger man he thought Kosrae was one of the prettiest islands in the Pacific. He returned—as one of the world's most successful botanists—to this still-enchanting dot in the ocean with an East-West Center expedition. The Center is an institute supported by the U.S. government, foundations, and the private sector to increase knowledge of and understanding between the East and the West. Expeditions have changed since Ray Fosberg first island-hopped in what is now the Federated States of Micronesia. The emphasis today is less on what new discoveries might be found in these underexplored hills and more on how to use traditional knowledge and pride to save the plants that remain.

Still, a botanist gets a certain thrill examining a plant that no one else has seen. The Kosraean and American group undertook an identification and collecting trip on Mount Mutunte that was the first stage in writing a book that will be titled *Plants of Kosrae.* Following is an account of this expedition...

Guided by Fosberg's field notes from 46 years (to the day) earlier, Kosraean experts Eric Waguk and Robert Tauglung, and University of Hawaii geographers Mark Merlin and Jim Juvik push their way through underbrush to the top of the 1,923 feet hill, Kosrae's second-highest peak. Fosberg, too old to make the strenuous climb, stays back at the hotel. The day is wet. The gentle coo of the common fruit pigeon accompanies us, with counterpoint from the much rarer Micronesian pigeon, which sings a deep, cat-like growl. Four white terns fly overhead.

Mark Merlin, an inveterate teacher, exemplifies the philosophy that life's race is won by the person who sees the most on the way through. "See the common 'ti' plant, *Cordyline fruticosa*," he says. (It's hard not to learn something when Mark is on a roll.) "It's a famine food, sacred all over the Pacific, is used for leis, and because of its steroidal saponins is used medicinally."

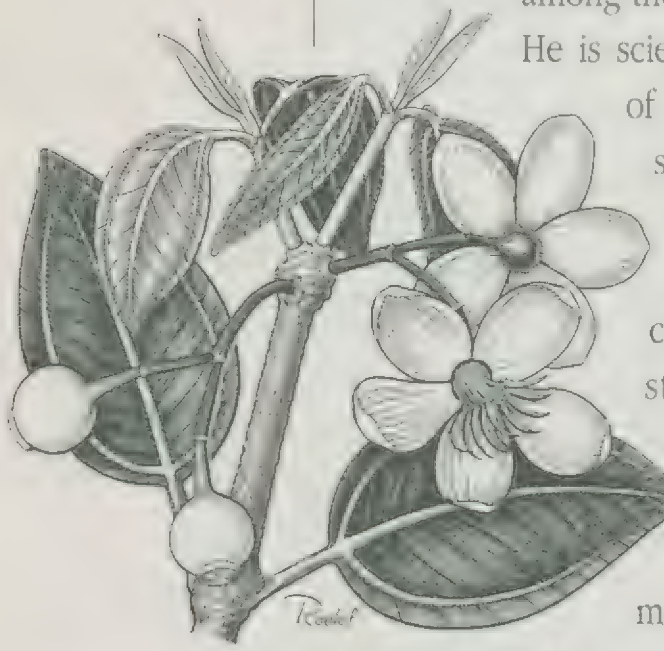


The group looks for interesting plants and places them in black plastic garbage bags. Mark is in his element. "Let's see, here's an unusual *Astronidum.* And an *Angiopteris* fern....This is interesting. Three samples of everything, that's what Fosberg wants. *Premna obtusifolia.* Fosberg collected it in 1946. Found all over Micronesia. People on Palau say it's a contact aphrodisiac."

I climb behind Eric Waguk, a forester who works with the Kosrae Division of

Agriculture. He wears a backward white baseball cap given to him by the U.S. Forest Service; I follow the image of Smokey Bear and the admonition "Remember...Only You!" After a while I sit and take a break from the climb and ask Eric why these plants matter. "Medicines," he says. "Everybody knows that. I'll give you an example. I was in the hospital for a month following a car accident. When I got out I had constant stiffness and pain in my back. The hospital gave me a pain killer, but it didn't help. Finally, my family asked an old lady to see me. She gave me local medicine and massage, and I got better."

Mark sits as well, but doesn't stop looking and explaining. He leans overhead. "Here's something different. Native member of the coffee family. Opposing leaves. If you open the fruit you should have two seeds. Right. Robert, what's the local name?" Robert Tauglung is among the most important men in this group. He is science coordinator in the Department of Education and it is his job to make sure that teachers use the information in the *Plants of Kosrae* to help instill a conservation-consciousness among island students. Robert can help with Kosraean names and folk tales, but is unable to provide much information on traditional medicinal uses. He explains that in Micronesia, knowledge is power, and a traditional healer might lose his or her power, or even die, if too much information is given. It's better not to ask. The practical implication is that there will be few detailed plant-based medicinal recipes in the *Plants of Kosrae.*



A Melastome, *Medinilla speciosa.* For more information on this species, please see the back cover.

We climb hand over hand as we approach the summit. The mist sets in as we enter Mutunte's cloud forest, a region of moss and mystery. Jim Juvik, who, like Merlin, worked on similar volumes on the plants of Palau and Pohnpei, explains forest hydrology. "These mossy cloud forests capture water from the wind-blown clouds, and help ensure Kosrae rivers flow all year. Students should know how the plants affect the water, which affects their farms. We'll put that into the book."

Back at the hotel we unpack the day's booty, which fills five large plastic garbage bags. Some specimens are crushed, and Ray Fosberg scolds the team members for being too lazy to carry cumbersome plant presses in the field. "What's this, then Ray? *Horsefieldia nunu?*" asks Mark. Fosberg agrees. Merlin pulls out another plant, and asks: "*Psychotria?*" "No," Fosberg says softly. "Different family." This is the botanical equivalent of opening the presents on Christmas Eve. Fosberg breaks the leaf of a tiny orchid. "Clean scar. It's a segregated *Rhynchophreatia.* First time I've seen this genus outside a herbarium."

"And how about this, Ray? I think Eric collected it." Fosberg unfolds the hand lens that he wears perpetually around his neck, like an amulet. He examines the leaves, then the pink Melastome flower. The beachfront porch is quiet, as several of us watch Ray at work. "I don't know," he says finally. "It's a Melastome but I've never seen this one. I know the Pacific Melostomes pretty well and this doesn't fit anything." As the week progressed the mysterious Melastoma, possibly a *Medinilla*, becomes just one of four possible new plants the group discovered during the quick visit.

But discovery of new species *per se* was not what the expedition was about. "I'm proud that we can still find new things in our forests," says Robert Tauglung. "I think the students will pay attention to this discovery." The book will become virtually the only source of information for teachers and students on the role of plants in Kosraean society. I asked Robert how important it was to change attitudes of young people. He told me that he had urged a school group to conserve "tok," the rattan-like plant of Kosrae. "They asked why and I told them that we use it to tie nipa palm fronds to make thatched roofs. The kids thought I was crazy. 'We don't need that,' they said. 'We have tin roofs now.'"

Plants on the island are used for housing construction, medicine, decoration, and for benefits that scientists like to call ecological services. "Unfortunately, most of the textbooks that teachers have access to talk about nature in the context of glaciers and American maple trees," observes Larry Hamilton, Research Associate at the East-West Center who organized this expedition with a grant from the MacArthur Foundation. "If you want to be relevant, you have to be local." While people in Kosrae live relatively uncomplicated lives, natural resources are increasingly being ignored and destroyed as the Coca Cola, Spam and Rambo culture continues to take over. Development in one corner of tiny Kosrae—the island is only 42 square miles, much smaller than Washington, D.C.—inevitably affects the rest of the state.

A walk down any path will be laden with the scent of rotting fruit, indicating an abundance of food that reflects the productivity of the moist, hot climate and rich volcanic soil. There are wild wonders in the hills, as well. As Mark notes, "Biodiversity is important everywhere. This place isn't as important on the global scale as, say, the Amazon, but it is somebody's backyard." Backyards are sometimes the scene of family squabbles, and arguments about the direction of Kosrae's development involves the future of Kosrae's plants.

The day before the "new plant" discovery I had hitched a lift with John Sigrah, a Kosraean who works at the efficient new Japanese-owned Phoenix Dive Center, which plans to bring in some 200 Japanese divers a month, double the current number of tourist arrivals. He pointed out each plot of land we passed between Phoenix and my hotel. "The Phoenix land is leased from Isao Sigrah. This plot is owned by Ted Sigrah. He'd like to lease it. Know anyone?" I asked John about the future. "I hope there will be more tourists," he said, good naturedly. "More money."

Gerson Jackson, head of the Kosrae Office of Budget and Planning, on the other hand, wants to do all he can to ensure that Kosrae remains Kosrae. His vision largely depends on the imaginative Kosrae Island Resource Management Program. It is the only comprehensive development bill in Micronesia that legislates the preservation of history and culture as well as water, land, and air. It establishes a Development Review Commission that "will be responsible for overseeing the wise use and protection of Kosrae's resources, balancing the needs of economic and social development with those of environmental quality and respect for our traditional ways."

Much of Kosrae's current thinking is incorporated in the Kosrae Island Resource Management Plan, which is largely the result of efforts of several agencies within the Pacific Island Network, including the East-West Center and the University of Hawaii Sea Grant Extension Program. The Program, which took several years and seven drafts to get through the state senate, is about to face its first real test. Developers are queueing to invest money in hotels, golf courses, and resorts. The government cannot afford to be too draconian and reject all development, since the current United States subsidy, which accounts for some 90 per cent of the federal budget, is due to end in 2001. People have come to expect paved roads, public services, and the cash that comes when 80 per cent of the work force has a job that depends on the government. With easy external cash comes social ills, such as modest problems with teenage abuse of marijuana, alcohol, and chewing tobacco. However, neither the financial nor the social situation is desperate. Kosrae is a conservative island. Traditions, mostly based on teachings of strict Congregationalist missionaries, discourage public drinking, for example, and prohibit virtually any activity on Sunday except going to church. People are thoughtful and reserved. There is an almost unnerving lack of "street noise."

Ray Fosberg (Photo by Paul Sochaczewski)

Kosrae still has 63 per cent of its land covered in forests. The island is in good shape and can still decide which way it wants to move. That direction will depend largely on the decisions of the island's leaders. "That's why this book [on the plants of Kosrae] is so important," Robert Tauglung says. "Many people in Kosrae like the word development, but they don't all realize what it means in the long run." I asked him for an example. "We have more money now but our children have vitamin deficiencies because of the change in diet," he explained. "If our leaders read this book, it will help them solve some of our problems."

I asked Eric Waguk about the competing pressures that one sees daily in Kosrae—the people who are willing to "develop" in order to continue to enjoy western comforts versus the traditionalists who like things pretty much the way they are. I asked him who will win in the end. He didn't hesitate. "I'll win. I'll still have my land—the other guys will have leased theirs. We'll see who has a better life."

Expeditions have changed since Ray Fosberg first island-hopped in what is now the Federated States of Micronesia. The emphasis today is less on what new discoveries might be found in these underexplored hills and more on how to use traditional knowledge and pride to save the plants that remain.

The role of economics in biological diversity

As I learned in discussions to draw up the first guidelines for country studies on biodiversity, biology and economics are worlds apart. It took some late night sessions to bridge the world-view, conceptual, and language gaps to complete the guidelines. Sylvie Donato's article, first given as an address in french to the French Canadian Association for the Advancement of Science (l'ACFAS) on 17 May 1994, addresses the interface between the two disciplines, critical to changing the status quo to new sustainable approaches. [D.E.M.]

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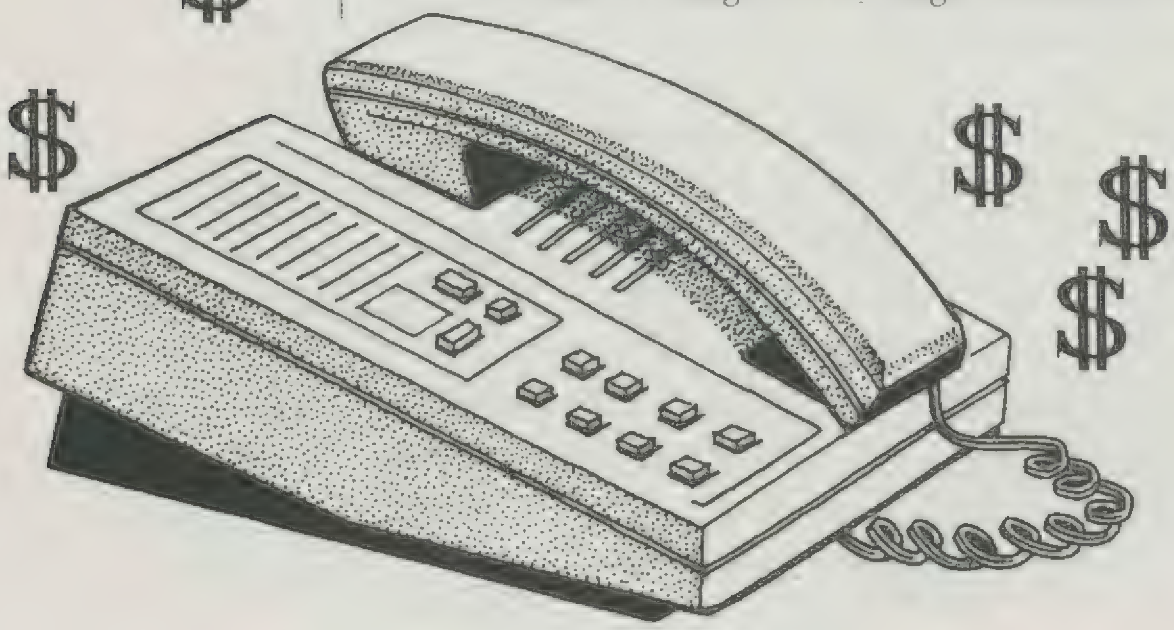
For an economist preoccupied by natural resource issues, the conservation of biological diversity and socio-economic development are important topics that require cost benefit analyses. To do so, we must be able to assign an economic value to biological diversity. But to do this, we must be able to define and measure biological diversity. It is this last issue, the measurement of biological diversity, that becomes the major obstacle—not only for economists, but also for biologists.

What we call natural selection is none other than the result of changes in the range of variation of a character. When we try to find the causes of these variations we see that they result in part from a certain flexibility in the capacity for development and in part from genetic variations. The result is an active potential for genetic disparity. This potential is equally present at the level of the individual, the species, the community, or the ecosystem. For this reason, biological diversity is usually treated from three different levels: genetic, species, and ecosystem diversity (McNeely 1988). It is within this context that the definition from the Canadian Association for the United Nations, that is, "the genetic variation, the number of species and the various ecosystems within which they co-exist," finds its true meaning.



Thus the difficulty in defining the concept of biodiversity comes from the fact that the concept embodies not one but several major components, notably relative abundance (richness and regularity) and variety. We can measure biodiversity more easily if we can define it. Within the context of the concept's major components, biologists have developed many models and indices to measure biological diversity mathematically. These fall under three categories: indices for richness, models related to abundance, and models based on the proportional abundance of species (Magurran 1988).

New schools of thought have emerged from previous work. To measure biodiversity, previous indices were based mainly on species biomass while the new indices follow the principles of numerical taxonomy (Vane-Wright *et al.* 1991) or consider group interactions (ecological heterogeneity models)(Scheiner 1992). The different approaches envisioned by biologists to measure biological diversity are certainly pertinent, but researchers themselves admit to the inadequacies of their models. Faced with this reality, it becomes important to acknowledge the contribution of several economists (Weitzman 1992, 1993; Solow, Polasky and Broadus 1993).

Economists, who for the past several years have been interested in the measurement of biological diversity, consider the theories of numerical taxonomy to be the most appropriate. Thus they favour the notions of genetic distancing and the grouping of species at the expense of the notions of richness and abundance. The problem, therefore, is to derive an appropriate measure for the diversity of a group containing a large number of species—while taking into account the measures of distance between all species pairs. We then get a measure of biodiversity as a function of the chosen group (Weitzman 1992).

If it is possible to define and measure biodiversity (two significant challenges), we can then consider being able to attach an economic value to biodiversity (Donato 1994). The existence of an "economic value" for biological diversity is readily visible. In effect, there exists throughout the world concrete actions for the preservation of biodiversity. For example, the genetic variation of species brings an important contribution to agriculture by offering the possibility of improving the variety of plants and livestock. Also, the biodiversity of plants and wild animals contributes significantly to the fields of medicine and pharmaceuticals.

The over-exploitation of natural resources is largely the result of the current economic systems. Within this context, it is important to evaluate biodiversity since we do not have the financial means to preserve all of the endangered species.

As a starting point, consider the notion of "value." In an economic context, this value can be composed of two principle components: the value associated with use and the value associated with existence. The value associated with existence reflects the benefit obtained simply by knowing that a thing exists. The value associated with use is the benefit obtained by using or consuming a good or service. A corresponding dollar amount can be assigned to the value of the realized benefit. For example, with respect to the environment we can consider the benefits obtained from bird or whale watching as value associated with use.

The opportunity cost (or quasi-opportunity) comes into play when there is uncertainty in the future supply or demand of a good and when a current decision irreversibly impacts the future availability of the said good. For example, even if it does not currently have a value, we might be willing to pay for the future use of a natural resource (which could be biological diversity itself) if its future demand is uncertain and if the decisions that must be taken now have an irreversible impact upon this natural resource.

What is the economic "value" of biodiversity? It is largely based on a value associated with use—specifically, its opportunity cost. For example, even if the biodiversity in this tundra scene does not currently have an economic value, we should consider being willing to pay for its future use (because the future demands are unknown), especially if current decisions have an irreversible impact upon this resource. Thus, economists can provide an important contribution to preserving biodiversity.

In reality then, opportunity cost is a value associated with use, but one that only presents itself under the combination of uncertainty of future supply or demand and the irreversibility of current decisions affecting the future availability of a good. The economic value of biological diversity is thus largely based on opportunity cost.

It's true that biologists and economists do not share the same concerns. In their studies, biologists propose a variety of indices or models that reflect their concerns, but that do not take into account economic reality. Economists, on the other hand, aim to develop a measure for the value of biodiversity that could then be used to evaluate biological diversity from an economic point of view. In so doing, economists provide an important contribution to an optimum strategy for the preservation of biodiversity.

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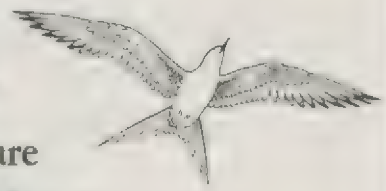
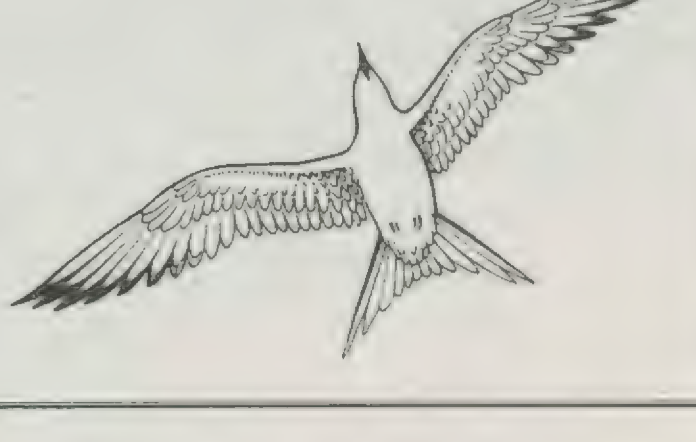
Diverse quotations

Climb the mountains and get their good tidings. Nature's peace will flow into you as sunshine flows into trees. The winds will blow their freshness into you, and the storms their energy, while cares will drop off like autumn leaves
John Muir, My first summer in the Sierra, 1939

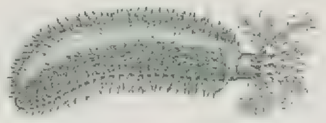
What is life? It is the flash of a firefly in the night. It is the breath of a buffalo in the winter time. It is the little shadow which runs across the grass and loses itself in the Sunset.
Crowfoot



If we are to answer the question of who we are, if we are to explain why we are built the way we are, and why we function and form societies, institutions, and cultures the way we do, then we can begin by examining some fundamental rules that all creatures are subject to. No serious consideration of ourselves ought to bypass these considerations because it is these rules that tie us to life on earth and make us a part, a spectacular part, of it.
Valerius Geist, 1978, Life strategies, human evolution, environmental design. Toward a biological theory of health.



White tern,
Sterna paradisaea



Marine biodiversity workshop on systematics and databases of tropical Pacific Islands

Concerned about losses in marine biodiversity around tropical Pacific islands, the need for biodiversity databases, and the dwindling numbers of taxonomists, the East-West Center held a workshop on this topic in Honolulu, Hawaii, November 2-4, 1994. The conference brought together marine taxonomists, database experts with an interest in using museum-based systematic (taxonomic) knowledge and expertise, through computer databases, for conservation of biodiversity and sustainable use of marine resources. [D.E.M.]

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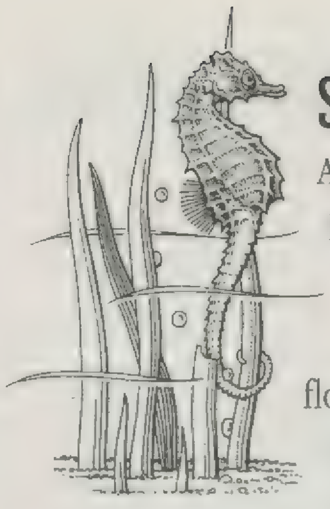
Ilustrious scientists and database experts in attendance at the Marine Biodiversity Workshop on Systematics and Databases of Tropical Pacific Islands included Dr. Charles Birkeland, University of Guam; Dr. Sylvia Earl, Deep Ocean Engineering; Dr. William Eschmeyer, California Academy of Sciences; Dr. John W. McManus and Dr. Rainer Froese, ICLARM, Manila; Dr. Alison Kay, University of Hawaii; Dr. Michael L. Smith, Center for Marine Conservation, Washington, D.C.; and Dr. John E.N. Vernon, Australian Institute of Marine Science. In attendance were 28 experts, 11 observers, and 8 graduate students.

BROAD PERSPECTIVE

Dr. Sylvia Earle opened the conference with a broad perspective. She shared insights from her ventures into the little explored depths—a large luminescent sea cucumber seen from a Japanese submersible, the news that the Deep Rover 3 video monitor equipped with undersea vehicle is now down and working. She indicated that ignorance and lack of caring were the greatest threats to conservation of marine biodiversity. To Dr. Earle, each "scrap" of biodiversity, the result of 4.5 billion years of evolution, should be saved. And each species lost moves us towards a point of no return.

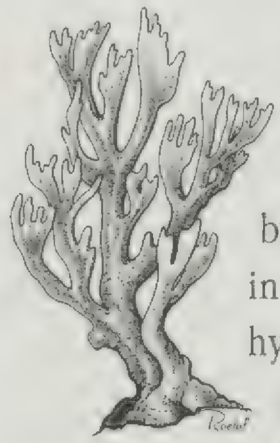
MANGROVES

Dr. Joanna C. Ellison of the Australian Institute of Marine Science spoke on mangroves. Although mangroves occupy a small global area, they play a key role in the land-ocean interfaces and help sustain coral reefs in many areas. She mentioned one species that secretes salt through the leaf surface. The dry salt crystals periodically wash off when it rains. There are very few mangrove taxonomists, which leads to problems, misidentification, and incorrect geographic records. There are 22 species, 14 genera, and 11 families of mangroves in the Pacific islands area. The greatest diversity is in the Solomons, but global patterns are unclear because of the lack of taxonomic research, misidentifications in the literature, lack of a database compiling information from existing specimens in herbaria, and geographic gaps in herbaria collections. This impedes understanding, conservation, and management. Funding into mangrove biosystematics and distribution would be worthwhile, especially in Indonesia, along with entering reliable identifications of existing herbarium material into a database.



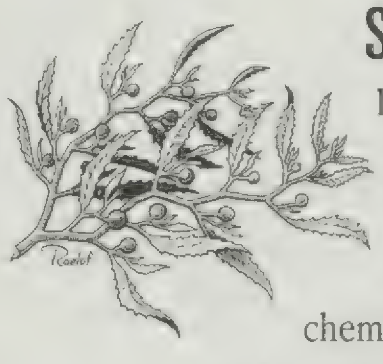
SEAGRASSES

A paper by Robert Coles and John Kuo was presented on species systematics of seagrasses. Seagrasses are unique amongst flowering plants in that they can live entirely immersed in seawater. Globally there are 58 species classified in 12 genera, 4 families, and 2 orders; 16 of these species are from the Pacific island region. But it is almost certain that new species remain to be described in the tropical Pacific and geographic ranges are incompletely documented as collections from this region are relatively few. Astonishingly, the total global area of seagrass has never been estimated. Unfortunately, seagrasses don't show up very well in aerial photos, yet they play a key role in stabilizing sediments and provide food for at least 153 molluscs, crustaceans, fishes, turtles, etc. Additionally, they provide shelter for a number of important fishes and crustaceans. Seagrasses are under threat in a number of areas because of eutrophication, land reclamation, and changes in land use. We learned that some sea grasses grew to at least 27 metres in depth, though were most common in 5 metres. There are 15 to 16 species in the Philippines. More rigorous taxonomic information and voucher specimens, to back records in databases, are needed to enhance our knowledge of seagrasses.



CORALS

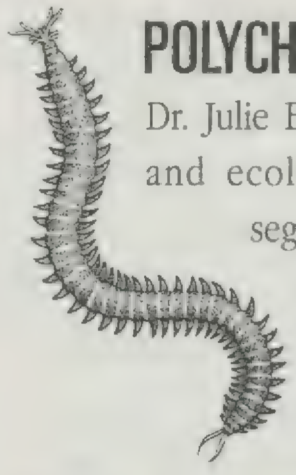
Charles Veron mentioned how species identification is complicated by corals developing different shapes in different habitats, and by hybridization within certain species groups (called syngamions) of corals. Genera of corals are more easily identified. Maps were displayed showing the global patterns of coral diversity at species and generic levels.



SEAWEEDS

Dr. Isabella Abbott spoke on systematics of seaweeds—the marine algae. One red algae contains a unique chemical that deters fish and sea urchins from eating it. Another has a sticky muco-polysaccharide that invertebrates avoid because they can get stuck in it. The taxonomy of marine algae is still in the alpha-taxonomic mode, with new species, genera, and families still being described. Taxonomy is a challenge because of the need to raise seaweeds through their life stages, and some have not yet been seen in the wild. Transmission microscopy of cell membrane configurations has shown useful classificatory characters, while molecular taxonomy shows promise. Seaweeds are valuable—one seaweed is worth $US70/kg in Hawaii while others are important as volume constituents in the global food industry. Seaweeds are also important as indicators of ecosystem health; for example, overgrowth of seaweeds on corals reefs indicates poor reef health. Hawaii has about 400 species, which is high for a warm water area, while Australia has about 700 species because of its cool southern waters. McManus pointed out the serious need for an identification book for seaweeds growing on coral reefs.

Description and classification of algal species is being held back—particularly those in tropical waters—because there are so few phycologists,. The lack of voucher specimens in herbaria prevents the verification of many literature records, a number of which are doubtful in view of recent advances in taxonomy.

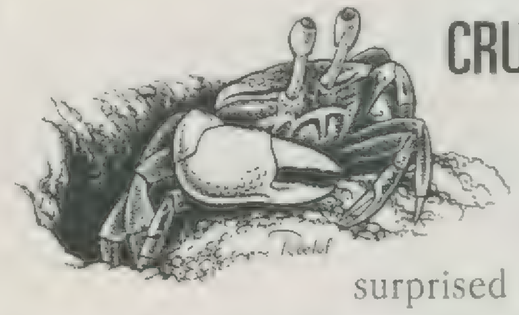


POLYCHAETES

Dr. Julie Bailey-Brock spoke on the taxonomy and ecology of polychaetes, the marine segmented bristle worms. This is one of the largest groups, in terms of species, in the oceans. They are valuable as food for fish and coniid molluscs, and help turn over sediments, while the tubes of tube-dwelling species form important habitats for smaller species on reef flats and sandy areas. The fireworms are named for the itching caused by tufts of calcareous setae or bristles that break off and release a toxin into the wound. Some like the serpulids make winding calcareous tubes out of which purple tentacles radiate, blossom-like, to quickly retract when approached. Tropical polychaetes are poorly known compared to those in temperate waters. They have not been given the priority allotted to fishes and corals, although there is increasing appreciation of their trophic dynamics in reefs and impacts on their geological structure. Taxonomic research is revealing that what were thought to be single subfamilies actually consist of complexes of related families.

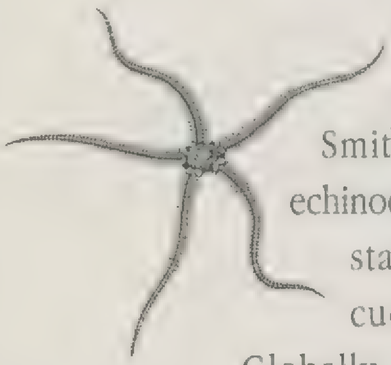
MOLLUSCS

Dr. E. Alison Kay of the University of Hawaii talked about molluscs, their systematics, and an information management system. Easily 3,000 species in 185 families occur in the islands of the tropical Pacific, with about 1,200 species from Indonesia alone. But there are revisions for only about 20-30 of these families. Molluscs form a significant biomass, at times outweighing the corals and carrying out many roles including herbivore, carnivore, parasite, detritivore, etc. In the Red Sea, the boring molluscs cause about 20% of the reef erosion. Pacific coral reef mollusc populations are being depleted in a number of areas for sale as far away as America, Scotland, and Cyprus.



CRUSTACEANS

Dr. Lucius Eldridge talked about crustaceans. I was surprised to learn that there were more than 2,000 species of crabs in the Indo-West Pacific. The task of describing species appears incomplete—an average of 220 new genera and subgenera per year were described over a 14-year period of Zoological Record. The higher classification of crustaceans is also in ferment, e.g. should Crustacea be a Phylum, Subphylum, or Superclass? There is a serious lack of mollusc taxonomic monographs, region-wide faunal works, and specialists. One family, the Parthanopidae, has not been re-examined in 68 years, and some families have never been monographed. Taxonomist positions at the Smithsonian are not being re-filled and there are few young crustacean taxonomists coming up.



ECHINODERMS

David L. Pawson of the Smithsonian talked about echinoderms, the group that contains starfishes, sea urchins, sea cucumbers, and sea lilies. Globally, there are more than 7,000 living species; in the tropical Indo-Pacific, about 1,200 nearshore species; the tropical island Pacific, 476 species—up from the 327 species recorded 25 years ago. Many species are widespread and there are few endemics amongst the Pacific island echinoderms. No geographic ranges coincide with the Pacific Plate. Echinoderms are better known than many invertebrate groups, but still a 1986 study was able to add 46% to the faunal list of the known echinoderm fauna of New Caledonia. The higher classification is under active enhancement and there are large gaps in our knowledge of reproduction, early life histories, food and feeding habits, migrations, and predator-prey relationships. Indonesia is the world's species hotspot for echinoderms. Well-known forms include the crown-of-thorns starfish, capable of devastating coral reefs, and the commercially important sea cucumber species prized as beche-de-mer or trepang.

REEF AND SHORE FISHES OF OCEANIA

Richard Pyle of the Bishop Museum talked on the systematics of reef and shore fishes of Oceania. These comprise 3,392 species in 166 families, but 13 of these families contain 65% of the species. While these fishes are relatively well known compared with invertebrates, there are still 441 species waiting to be described and named. In spite of this known backlog of unnamed species, the rate of new species descriptions has declined in recent years, probably reflecting the reduced funding for basic taxonomic research. The triplefins and gobies have the most species waiting description. About 20% of the reef and shore fishes of the Pacific island regions require a modern revision. What is mostly needed is a summary of existing knowledge with documentation of information sources to help verify the data.

Fishes of the deep reef or twilight zone at the limits of diving are poorly known. Richard has been exploring this area using mixed-gas scuba diving apparatus. On a deep dive in the Rarotonga he discovered more new species in 60 minutes than were discovered in the last 5 years in all of Oceania. This included 2 new angelfishes, one yellow-coloured with a dark spot. Another 64 new species were uncovered and his new breathing system promises to triple or quadruple the short bottom times that present diving gear permits, while a newtsuit may allow one to work at depth under surface pressures while providing enough flexibility to swim. Another startling discovery is the finding of hermatypic (i.e. reef-building) coral reefs as deep as 400 m, some of them lush.

PORIFERA

Michelle Kelly-Borges, Natural History Museum, U.K., sent in a paper on the taxonomy, systematics, and biogeography of the Porifera or sponges. More than 500 species are known from the tropical Pacific islands, but many species remain to be described. There is a serious lack of general reviews and an urgent need for thorough documentation of the sponges, especially on the less well known oceanic islands and atolls. Revisions, identifications, and the growing sponge chemical literature are hampered by the lack of taxonomic revisions and the need to histologically examine the specimens or look at their tissues under a microscope .

NEW MARINE CLASSIFICATION

Paul Holthus of the Nature Conservancy, Honolulu, described a new marine ecosystem classification for the tropical Pacific. This thoroughly examines, in a hierarchical manner, the basis underpinning the marine ecosystems of the Pacific. It will provide an important tool for research conservation and management. This classification has been tried out on the U.S. affiliated islands in the tropical Pacific. One of the participants suggested that this system be expanded to include the tropical Atlantic and Indian Oceans. One hopes this will be done, and that boreal and polar ecologists will take up the challenge and expand the system to include their environments and ecosystems.

CORAL REEF INITIATIVE

James E. Maragos, East-West Center, Honolulu, described the U.S. Coral Reef Initiative, which offers the potential for intensified research and monitoring, nationally and internationally.

CLIMATE CHANGE AND CORAL REEFS

Dr. Charles E. Birkeland of the University of Guam spoke about the implications of climate change for coral reefs. He drew attention to a paleontologist who found that in the geological past, coral reefs began declining before other ecosystems during major extinctions. Thus coral reefs could be harbingers of major changes and losses. He discussed coral reef monitoring programmes like the Caribbean Coastal Marine Productivity Programme (CARICOMP) that have recently been launched. But he underlined the importance of using old surveys back to the 1800s and early 1900s as baselines for modern monitoring. For example, re-examination of Alexander Agassiz's sites in the Florida Keys showed changes in the populations of the branching coral, *Acropora.* He also indicated that taxonomic identification capacity was critical in monitoring impacts of climatic change. Unfortunately there are few experts capable of identification to species level.

There are a number of significant biodiversity databases that hold geographic taxonomic and ecological information on thousands of species and ecosystems. Space in this issue does not permit discussion of these exceedingly valuable resources. Regional databases discussed included:

- Hawaii Biological Survey by Allen Allison and Scott Miller
- Marshall Atoll Resources Information System by Karin Meier
- AeGis and the Hawaii Environmental Risk Ranking Project by Jim Laurel
- Hawaii Heritage Program by Samuel Gon
- Biodiversity Database for the Caribbean by Michael L. Smith
- Coral Database for the Caribbean by Kathleen Sullivan.

The following table on the next two pages lists global databases discussed.

Speaker	Database	Contents	Location
Mark D. Spalding	World Conservation Monitoring Center (WCMC)	•Species: Higher animals and plants of the world •27,000 animal & 81,000 plant taxa (mostly terrestrial) •Protected areas •Biodiversity Map Library	Cambridge, UK. Established 1988
John McManus	ReefBase	•Coral reefs of world •Bibliography begun July 1994 •Data on about 100 reefs •Data on corals, fishes & selected invertebrates •Will include maps, and links to FishBase & CoralBase	ICLARM, Manila. Just established. CD-ROM version targetted for 1996.
Kim F. Navin	CoralBase	•Covers scleratinian coral taxa for 900 species from 350 locations •Synonymies & other taxonomic, biogeographic (4000 references) & bibliographic data	AIMS, Townsville, Australia. Will be released on CD ROM.
Dr. Rainer Froese	FishBase	•Global marine and fresh water fishes; 12,000 species •Includes names, commercial importance, life history, food-sports-ornamental value, threatened status,etc.	ICLARM, Manila. Will be distributed on CD ROM with annual updates. Established 1990.

Speaker	Database	Contents	Location
William N. Eschmeyer	Fish Taxon Database	•Taxonomic list of global fish species 55,000 taxa •25,000 valid species •Synonyms, original description citations, references, journals, Museums, place names	California Academy of Sciences, San Francisco
Don McAllister	Coral fishbase with equal-area grid	•Geo-referenced (latitude-longitude) data for 1,100 species (data for over 1,600 species will be captured within a year) of coral reef fishes of the world. •Information is also recorded for occurence in cells of a global equal-area grid system capable of showing hotspots of fish, habitat, environmental and human impact data.	Ocean Voice International, Ottawa for IUCN Species Survival Commission. Data also to to be stored by WCMC. Begun in 1990.

DISCUSSIONS AND RECOMMENDATIONS

The workshop ended with a day's discussions of the presentations and drafting of a series of recommendations on information management systems for the Island Pacific and on taxonomy. The papers and recommendations are planned to be published in book form by the East-West Center, Honolulu in 1995.

At the East-West Center's conference on marine biodiversity, Dr. Michael Smith, ichthyologist, discussed the Biodiversity Database for the Caribbean. Mark Spalding, database expert, spoke on the global database sponsored by the World Conservation Monitoring Center. (Photo by Don McAllister)

DECLARATION OF INTERDEPENDENCE

THIS WE KNOW

We are the earth, through the
plants and animals that nourish us

We are the rains and the oceans that
flow through our veins.

We are the breath of the forests
of the land, and the plants of the sea.

We are human animals, related to all other life as
descendants of the firstborn cell.

We share with these kin a
common history, written in our genes.
We share a common present, filled with uncertainty.
And we share a common future, as yet untold.

We humans are but one of thirty million species
weaving the thin layer of life enveloping the world.

The stability of communities of living
things depends upon this diversity.

Linked in that web, we are interconnected–
using, cleansing, sharing and replenishing the
fundamental elements of life.

Our home, planet Earth, is finite;
all life shares its resources and the energy from the sun,
and therefore has limits to growth.

For the first time, we have touched those limits.

When we compromise the air, the water, the soil and the
variety of life, we steal from the endless future
to serve the fleeting present.

We may deny these things,but we cannot change them.

THIS WE BELIEVE

Humans have become so numerous and our tools
so powerful that we have driven fellow creatures to
extinction, damned the great rivers, torn down
ancient forests, poisoned the earth, rain and wind,
and ripped holes in the sky.

Our science has brought pain as well as joy; our
comfort is paid for by the suffering of millions.

We are learning from our mistakes, we are mourning our
vanished kin, and we now build a new politics of hope.

We respect and uphold the absolute
need for clean air, water and soil.

We see that economic activities that benefit the few
while shrinking the inheritance of many are wrong.

And since environmental degradation erodes biological
capital forever, full ecological and social cost
must enter all equations of development.

We are one brief generation in the long march of time;
the future is not ours to erase.

So where knowledge is limited, we will
remember all those who will walk after us,
and err on the side of caution.

THIS WE RESOLVE

All this that we know and believe must now
become the foundation of the way we live.

At this turning point in our relationship with Earth,we
work for an evolution: from dominance to partnership;
from fragmentation to connection; from insecurity,
to interdependence.

The David Suzuki Foundation,
2075 W. 12th Ave., Vancouver, B.C., Canada V6J 2G3
Phone: (604) 732-4228
Fax: (604) 732-0752

The Canadian Museum of Nature is pleased to provide an open forum for diverse viewpoints even though they may not represent the views of the Museum itself. Comments on these viewpoints are encouraged. Please mail or fax them to the editor (address on inside front cover).

Biodiversity News

INTERNATIONAL FORUM: BIODIVERSITY, SCIENCE & DEVELOPMENT HELD BY IUBS

A challenging conference providing scientific scrutiny of the state of life on Earth and the implications of scientific knowledge was held at the UNESCO headquarters in Paris, France, 5-9 September 1994. This international forum, **Biodiversity, Science & Development, a New Partnership**, was organized by the International Union of Biological Sciences (IUBS), co-sponsored by UNESCO, France, and the International Council of Scientific Unions. Over 300 people attended.

Nine panels discussed the following topics: Approaching the unity of life through biodiversity; Ecological functions of biodiversity; Global inventorying and monitoring of biodiversity; Conservation of biodiversity; Biodiversity and agriculture, pastures and forestry; Biodiversity and aquaculture and fisheries; Biodiversity and industry (Pharmaceutical and Biodiversity); Biodiversity in urban and peri-urban environments; and Biodiversity: Cultural and ethical aspects. Chairs and panels included eminent scientists such as Crawford (Buzz) Holling (ecologist), Madhav Gadgil (human ecologist), J. Frederick Grassle (marine biologist), David L. Hawksworth (mycologist), Neil R. Chalmers (museum director), Joel Craycraft (biosystematist), Rodrigo Gamez (biodiversity institute director), and many others.

The variety of biological disciplines represented, the quality of the participants attending, and the trenchant and current questions posed made for vigorous discussions and debate. Issues were discussed engaging the entire breadth of biodiversity. A small sample follows:

- Mechanisms for horizontal gene transfer and prerequisites for success of DNA acquisition in microbes.
- Evolution of human artifacts and their impact on biodiversity. Buildings, cars, boats, roads, etc. evolve, multiply, and take up space. We have often chosen artifacts over nature.
- Diversity in marine ecosystems. Here diversity is known to be high at the higher taxonomic levels in the sea relative to land, but recent discoveries challenge the notion that the sea is species-poor.
- Ecological functions of biological diversity. This focussed on questions of species redundancy and human shaping of agroecosystems. The essential ecological functions were little discussed in this forum but were alluded to by other panels.
- Monitoring and inventorying biodiversity. The discussions contrasted approaches involving inventories, collections, and biosystematics with ecological and structural evaluation of biodiversity. Wiser heads indicated the need for both biosystematic and ecological approaches. Some approaches—hotspot analysis, RAP, and use of higher taxa surrogates as indices of biodiversity richness, were not discussed. Joel Craycraft summarized the recently released Systematics Agenda 2000, while Rodrigo Gamez summarized the inventory-conservation-use approach developed in Costa Rica.
- Conservation of biodiversity. Discussed was the need to integrate approaches using protected areas and sustainable use while taking into account measures to deal with rural poverty and population increases. One panelist said all people should have access to knowledge on family planning, providing the opportunity of choice—the true basis of freedom.
- Biodiversity management in northern forests. Canadians insist that biodiversity be covered in forest management. Tools are available for Canadian foresters to begin managing forest biodiversity. Intensive management is a

current threat to forest biodiversity in Canada. Robust policies should take into account the precautionary principle.

- Biodiversity and fisheries. Discussed were the effects of hatcheries, aquaculture, stock genetics, and introductions. The focus on commercial species neglected biodiversity impacted by bycatches and gear impact in fisheries, soil biota affected by agriculture monoculture and pesticides, the displacement of natural habitat like mangrove swamps with fish ponds and the escape of exotic species from them. Those are major areas of concern that need attention. Resource managers must now assume responsibility for biodiversity as well as resource species. The focus of these discussions suggests that the resource sciences, as a group, are not quite ready for ecologically sustainable approaches.

The forum discussion was wide ranging and thorough in many areas of science, needs evaluation, and conservation. But anthropocentric points of view predominated. There was little consideration in many panels of the right of other species to exist, no calculations of the relative size of areas needed to conserve biodiversity, or to provide ecological functions for the planet.

One of the more interesting behind-the-scenes proposals being discussed was the establishment of a checklist of all of the species of the world. The need is there for research, conservation, and resource management. The checklist database could be central, or it could be provided by a network that would link databases for various taxonomic groups. The linkage approach would be facilitated by adopting a common format or a translator that would enable comparable output from different databases. Updates were provided on efforts to harmonize the taxonomic codes of nomenclature for zoology, botany, and microbiology. Harmonization would be accompanied by efforts to simplify the codes, and to minimize disruptive non-science-based name changes. A global checklist and harmonization of codes would be a boon to making taxonomic data accessible and easier to update as we uncover the 90% or so of new species that remain to be described, named, and classified.

A mechanism should be found to make the panel presentations available. Access via Internet or diskettes would be friendly to forests, though not accessible to all. [D.E.M.]

ENDANGERED HAWAIIAN PLANT SPECIES

The Hawaiian Botanical Society has just published their "Special Newsletter" with the latest (18 August 1994) federal listing of Endangered, Proposed and Candidate Plant Species for Hawaii. The 187 taxa are listed by Latin name, common/Hawaiian name, and island distribution. There is also an alphabetical listing by Latin name with listing dates, and common/Hawaiian name. Also included is an annotated bibliography on Rare Plant Conservation and Endangered Species Law. The newsletter is 59 pages long and copies can be obtained for US$3.00. Send requests to:

Special Newsletter, 1994
Hawaiian Botanical Society
c/o Department of Botany
3190 Maile Way #101
Honolulu, Hawaii, USA 96822-2279

or e-mail your request to:
Benton Kealii Pang <benton@uhunix.uhcc.hawaii.edu>
Benton Kealii Pang

BRITISH DARWIN INITIATIVE FUNDS BIODIVERSITY WORK IN UK AND GLOBALLY

The UK Department of the Environment has solicited a third round of biodiversity projects from British institutions, organizations, and individuals. Project priorities include collaboration with countries poor in resources and high in biodiversity, including training in taxonomic and other techniques, and could include improvement of access to data held in British institutions, such as museums; support to institutions or scientists active in the biodiversity field in need of support due to breakdown of political and economic systems in countries in eastern Europe and the former Soviet Union; support for short courses in Britain on conservation and sustainable use of resources; some research on neglected or undervalued aspects of work on biodiversity and particularly carried out in cooperation with local people outside of Britain, if possible having an educational aspect and engaging a wider community; work on helping developing countries give effect to the provisions of the Biodiversity Convention, particularly those concentrating on the production of national reports, sustainable use, benefit-sharing arrangements, and the rights of indigenous peoples over biological resources.

The Darwin Initiative for the Survival of Species was originally announced by the Prime Minister at the Earth Summit in June 1992. The closing date for the third round of invitations for Darwin Initiatives was 30 November 1994. There will be £9 million in total available over the next three years (subject to parliamentary approval) to support projects which meet the objectives of the Initiative. However, about £2.5 million of this funding has already been committed for the later years of the 53 projects already approved.

Projects implemented under previous rounds include: measurement of the biodiversity in vegetation species in the Russian Arctic and assessment of the impact of pollution; research into the Merbok mangrove ecosystem in Malaysia and development of management guidelines for conserving invertebrate species diversity within mangrove areas; study of the diversity of fish faunas and aquatic ecosystems in the Rwenzori mountains of western Uganda; study of the effects of different management regimes on tropical grasslands in Nepal; production and collection of onion landraces in west Africa for performance trials and storage to encourage onion seed production in the Sahel; and study of the human usage and perception of the greenheart tree and associated ethnobiological issues.

For more information about the Darwin Initiative contact:
EPINT, Department of the Environment, Room A304,
Romney House, 43 Marsham Street, London SW1P 3PY

REPUBLICANS PROMISE SCIENCE CUTS IN U.S.A.

Republicans, in a majority following the recent elections, plan cuts and cancellations of some $11.2 billion in science programs, including several environmental areas. This includes abolishing the (newly reorganized) National Biological Survey and U.S. Geological Survey (5-year reduction of $4.22 billion), cutting Agricultural Research ($830 million), and several National Oceanographic and Atmospheric Administration programs ($805 million). The Endangered Species Act will probably die (it was up for re-enactment about 3 years ago). [Science 266: 531, 28 October 1994; BIODICEN-L Distribution List of Internet, 21 November 1994].

The intended abolition of the National Biological Survey, expiration of the Endangered Species Act, and the other cuts in biological research would seem to make it difficult to meet commitments made when the U.S. government signed the International Convention on Biological Diversity. A spokesperson for the Republican National Committee said much of the research can be done in the private sector. If the government pays the private sector to carry out the research, then the intended savings will be reduced. It is unlikely that the private sector would carry out the research on its own. The closing of the National Biological Survey will eliminate the vital data that the Survey would provide for research on and conservation of biodiversity, sustainable use of biological resources, and the development of new bioindustries. The taxonomy and distribution of approximately one half of American species of plants, animals, and microorganisms is unknown. The plans of the Republicans contrast with those of the U.K. government described in the Darwin Initiative. Story on page 33.[D.E.M.]

CHILDREN WIN ENVIRONMENTAL LAWSUIT

A group of Filipino children filed, and won, a lawsuit against the Department of the Environment and Natural Resources for neglecting future generations. In a decision that may change the way the world views environmental issues, the Supreme Court ruled that children may sue on behalf of their own, as well as future, generations. The 30 July 1993 Supreme Court decision held that minors have standing to represent their own and future generations under the doctrine of intergenerational equity. The children claimed that the forest is part of their natural and international patrimony, but with the current rate of logging, there would be nothing left for future generations to use, benefit from, and enjoy. [WordWIDE News, WordWIDE's Quarterly Newsletter on Women in Development and Environment, 1994, (2): 10].

FAO TO MANAGE PLANT GERMPLASM BANK

In October 1994 the Consulative Group on International Agricultural Research (CGIAR) made its vast collection of germplasm samples part of a broader network managed by the United Nations' Food and Agricultural Organization (FAO). This reverses earlier plans (see *Global biodiversity* 4(3):30-31) to have CGIAR's collections managed by the World Bank. CGIAR will maintain its some 500,000 samples, about 40% of the world's stock, and FAO will act as an international arbiter

Doug Watson, a technician with the Genebank, working in the greenhouse where seed performance is tested. (Photo courtesy of Agriculture and Agri-Food Canada's National Crop Genebank)

to ensure germplasm is distributed fairly. Still to be resolved is how developing countries will collect royalties on the use of germplasm, as established by the Convention on Biological Diversity. FAO has begun a two-year negotiation process to settle the method of distributing the royalties. [Science 266: 531, 28 October 1994].

BCEPA HISTORY AND HIGHLIGHTS

A final draft of new environmental legislation is ready for British Columbia, Canada. The British Columbia Environmental Protection Act (BCEPA) is a proposal by the B.C. Ministry of Environment, Lands and Parks to consolidate and reform several statutes into one comprehensive bill. It is proposed that the following statutes be replaced by the BCEPA: Waste Management Act; Environment Management Act; Pesticide Control Act; Litter Act; and Ministry of Environment Act.

The proposed act aims at improved efficiency and reduced costs. It would, for example: emphasize planned pollution prevention over "end-of-pipe" control; work in closer partnership with business, local and aboriginal governments, and non-governmental agencies; include enforcement options more in line with recent legislation elsewhere in Canada; work toward integrated pest management; include recent contaminated site legislation; include policies regarding environmental accidents and emergencies; and institute a common appeal process for Ministry programs. Fundamental to the BCEPA legislation is the hierarchy of reduce, reuse, recycle, recover and residuals management.

The proposed act also suggests using economic incentives such as levies, deposits, fees and related charges to encourage environmentally responsible behaviour at all levels, from the individual to the corporation.

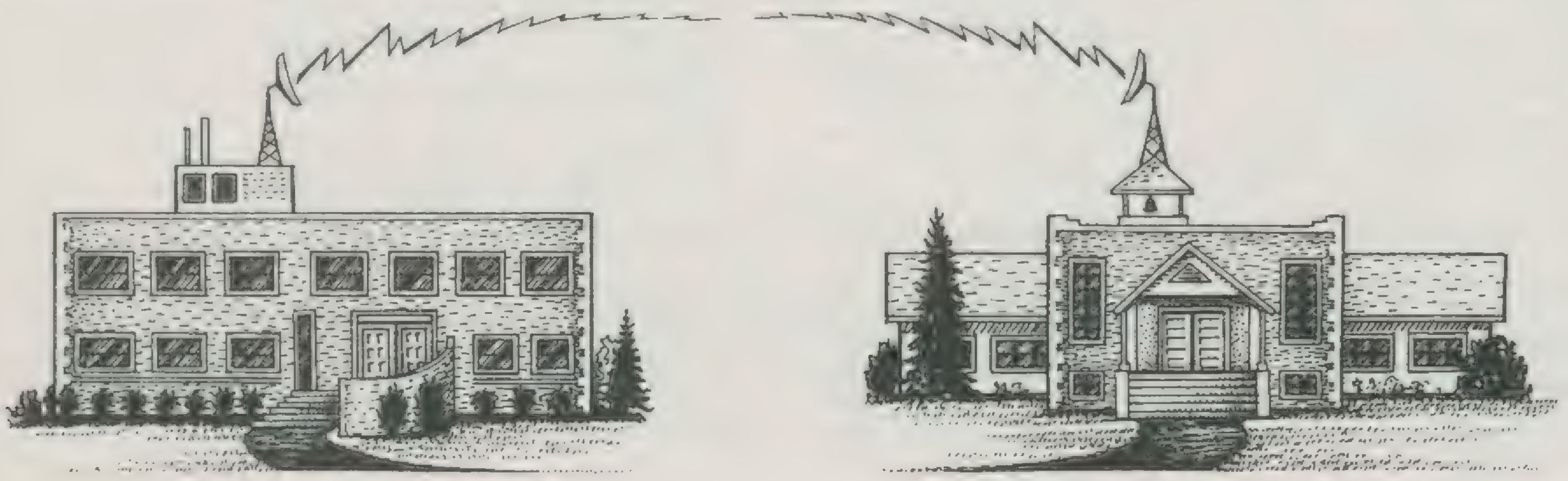
The Environmental Bill of Rights (EBR) was originally to be included within the BCEPA. However, consultation ongoing since April 1992 revealed widespread concern on the part of review committee members and the public over this section of the act. The EBR has therefore been removed from the draft BCEPA pending further review.

The proposed BCEPA should soon be reviewed by Cabinet as possible future legislation. A hard or diskette copy of the draft BCEPA may be obtained from the British Columbia Recycling Hotline. Call 1-800-667-4321. The BCEPA is also available online on the Internet through the "World Wide Web" (point your browsers to: http://ssbux 1 .env.gov.bc.ca/envhome.htm 1) or on the Ministry of Environment, Lands and Parks Gopher. [BC Ministry of Environment, Lands and Parks, Environmental Protection Program Bulletin, No. 6, October 1994: 1-2.]

SCHOOLNET—CANADIAN SCHOOLS ON THE INTERNET

SchoolNet is a cooperative initiative of Canada's provincial, territorial, and federal governments with educators, universities, colleges, and industry. It aims to link all of Canada's 16,000 plus schools to the electronic highway.

Its first-year current status reports over 5,000 users of SchoolNet services. Network access was set up for over 400 schools (including rural and remote areas) and over 1 million connections were made to the SchoolNet Gopher services. Schools from every province and territory are using SchoolNet services and over 800 support questions were fielded by Support Group.



SchoolNet services are based upon an Internet information distribution system called "Gopher" and are freely available to all schools provided they have the required technology and access to an Internet node with an Internet Gopher client. SchoolNet can be accessed by connecting to the SchoolNet Gopher "GOPHER.SCHOOLNET.CARLETON.CA" For more information on SchoolNet, please contact the National SchoolNet Office, Industry Canada, 235 Queen Street, Room 850F, Ottawa, Ontario K1A 0H5, Tel: (613) 991-6057, Fax: (613) 941-2811.

Cyberdiversity:

Biodiversity and the Internet

CANADIAN CENTRE FOR BIODIVERSITY AND THE INTERNET

The Canadian Centre for Biodiversity (CCB) has an Internet resource area and discussion group that is a component of the rapidly growing "freenet" network. The CCB's freenet site is with the National Capital Freenet (NCF), administered through Carleton University in Ottawa, Canada. Currently, there are two ways for Internet users to access this area: to dial in directly, or to connect via the Internet. The Internet Gopher is unfortunately not a means by which our area can be reached at the present time.

DIALING IN

To call in directly, long-distance rates apply to users outside the immediate Ottawa area. Your modem should be set to N-8-1 and dial (613) 564-3600 (2400 baud) (613) 564-0808 (14400 baud). There will be no immediate response after the NCF has "picked up the phone." You will have to press a series of 3, 4 or maybe even 5 hard returns ("Enter" or "Return" key) about one second apart to prompt the NCF system into action. Then log in as a guest and have a look around. Please register as an NCF user if you would like full privileges of the system. Instructions on how to register are listed below. (NCF requests donations and requires you to complete and mail in just a bit of paperwork).

CONNECTING VIA INTERNET

To connect via Internet, you will need access to a host system on the Internet that supports telnet. You may have to ask your local System Operator (SYSOP) for advice. If you have access to telnet, then you telnet to the following NCF address:

freenet.carleton.ca

and at that point you should simply login as a guest. Then you are operating just as if you dialed in. The option of registering as an NCF user is also open to people coming in via the network. That will then give you the full privileges of any user.

Some people may find it easier to use an IP address, which is a numerical version of the alphanumeric address mentioned above. The IP address is: 134.117.1.25

Or some people may want to access NCF through World Wide Web (WWW). WWW is a graphical subset of the Internet. Images, sound, and video are transmitted "live." It is the fastest growing subset of the Internet as it contains a richer, broader type of information than the often dry, text-based information found on the rest of the Internet. Here's how you can reach us through WWW:

World Wide Web:
URL to htp://www.ncf.carleton.ca/freeport/social services/eco/gorgs/cc-biodiv/menu

"URL" stands for "Uniform Resource Locator" and is the method of directly accessing places on WWW for which you know the addresses.

NCF REGISTRATION

As a guest you are not able to send e-mail, post messages in discussion groups, or access the Internet Gopher. Therefore, it is useful to register and get full access (and it won't cost you anything—this is freenet).

To find the NCF registration package, start at the Main Menu:
Press 2 - for Administration
Press 4 - for Getting an Account

If your modem software allows you to capture text, you can copy the registration package to a file on your computer. Instructions are clearly spelled out.

Before leaving from your first visit it would be a good idea to take a copy of the "Survival Guide for New Users" for you to look at while your registration is being mailed and processed. To find the guide, start at the Main Menu:

Press 2 - for Administration
Press 1 - for Survival Guide for New Users
Then, the easiest way for newcomers is to again have your own modem software capture the text. Start the capture feature and:

Press 1 - for About the Survival Guide for New Users
and keep scrolling through the text to the end of the document. There are better ways, but this is the easiest way if you are a newcomer to the NCF. This document is useful because it tells you, among other things, some important steps about letting the NCF system know how to relate best to your computer setup.

To find the Canadian Biodiversity Information Section, at any menu when you are prompted with
"Your Choice ==>"
simply type "go ccb" (without the quotation marks).

Alternatively you can track through the various menus to get a feel for where the CCB is actually located in system, discovering other interesting facets of NCF along the way. To find the CCB using the menus, start at the Main Menu:

Press 5 - for "Social Services, Health and the Environment"
Press 1 - for "the Environment"
Press 5 - for "Government Organizations"
Press 7 - for "Canadian Centre for Biodiversity"

Note: the numbers could change due to NCF restructuring of menus as new areas are added, so look for the titles.

In the CCB area you will find background information files on the CCB, on the Canadian Museum of Nature, a FAQ (Frequently Asked Questions) area, information about CCB's quarterly bulletin, *Global biodiversity / La biodiversité mondiale*, a list of Museum products and publications, and a public discussion group. These have been placed into Freenet with the purpose of enhancing public awareness of biodiversity issues as well as participation in biodiversity initiatives.

For more information contact:

Rob Huntley
CompuServe: 71022,3537; Internet:rob@pinetree.org OR ag508@freenet.carleton.ca
(Rob Huntley was instrumental in setting up the CCB information Section on Freenet)

Noel Alfonso
Internet: ah201@freenet.carleton.ca OR nalfonso@mus-nature.ca

GOPHER SERVER FOR SMITHSONIAN BOTANY CATALOGS

The Department of Botany of the National Museum of Natural History, Smithsonian Institution, is pleased to announce the inauguration of a Gopher Server that will provide Internet access to databases and documents that their staff has created or now manages. A gopher is a user-friendly way of getting access to information on the Internet. Gophers, run by gopher server software, are menu driven, hence easy to use. The gopher can lead directly to text files, or route a path through other gopher servers. Gophers are a great help in finding information.

Of particular interest is the Type Specimen Register of the U.S. National Herbarium, which is the world's largest electronic database of plant types, with over 88,000 records, and will become an important reference for monographers and flora writers. Also their Index to Historical Collections is the most comprehensive account of collectors represented in the U.S. National Herbarium. Neither of these databases were available electronically or in a printed form before.

For a brochure describing this service in greater detail, contact Warren Wagner, Curator of Pacific Botany, National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A. 20560. [Wildflower 10(3): 8, Summer 1994].

Tell us what you think!
We encourage readers to explore the CCB section on NCF. What questions do you have about biodiversity and current initiatives? Do the articles in *Global biodiversity* stimulate you? Do you have a burning issue that you'd like to see covered in a future issue? Hook up and let us know!

Biodiversity Meetings

3-6 APRIL 1995

The 6th Global Warming International Conference and Expo, to be held in San Francisco, U.S.A.

Contact:
Global Warming International Centre
One Heritage Plaza
P.O. Box 5275
Woodridge, IL
U.S.A. 60517-0275
Tel: (708) 910-1551
Fax: (708) 910-1561

11-13 APRIL 1995

Saskatchewan Biodiversity Conference, to be held in Regina, Saskatchewan.

Contact:
Pauline Nystrom
Environment and Resource Management
Wildlife Branch
3211 Albert Street
Regina, Saskatchewan
S4S 5W6
Tel: (306) 787-2314
Fax: (306) 787-9544

18-19 APRIL 1995.

More than Aware: Women Making a Difference for the Environment, to be held in Pittsburgh, Pennsylvania, U.S.A.

Contact:
Conference Coordinator
Chatham College
Woodland Rd.
Pittsburgh, PA
U.S.A. 15232
Fax: (412) 365-1610

19-21 APRIL 1995

The Units of Biodiversity, Species in Practice, an International Symposium of the Systematics Association, to be held at the University of Wales, Cardiff.

Contact:
Professor M.F. Claridge
School of Pure and Applied Biology
University of Wales
Cardiff CF1 3TL, U.K.
Tel. 0222 874147, Fax: 0222 874305

19-21 APRIL 1995

International Conference on the Value and Valuation of Natural Science Collections, held at Manchester University, U.K.

Contact:
Conference Office
The University of Manchester
Oxford Road, Manchester M13 9PL, UK
Tel: 061 275 2156
Fax: 061 275 3000

7-11 MAY 1995

II International Congress on Managing Amazonian Wildlife, to be held in Iquitos, Peru.

Contact:
Richard E. Bodmer, International Coordinator
Tropical Conservation and Development Program
University of Florida
304 Grinter Hall
P.O. Box 115531
Gainesville, Florida
U.S.A. 32611
Tel: (904) 392-6548
Fax: (904) 392-0085

8-10 MAY 1995

Planning for a Sustainable Future: The Case of the North American Great Plains, to be held in Lincoln, Nebraska

Contact:
Dr. Donald A. Wilhite
Director, International Drought Information Centre
P.O. Box 830728
University of Nebraska
Lincoln, Nebraska
U.S.A. 68583-0728
Tel: (402) 472-6707 Fax: (402) 472-6614
E-mail: agme002@unlvm.unl.edu

10-13 MAY 1995

The Second International Conference on the Convention on Biological Diversity: Access to Genetic Resources, to be held in Nairobi, Kenya.

Contacts:
Dr. John Mugabe
African Centre for Technology Studies
P.O. Box 45917
Nairobi, Kenya
Tel: (254-2) 565173/569986
Fax: (254-2) 569989
e-mail: acts@elci.gn.apc.org

Dr. Kenton Miller
World Resources Institute
1709 New York Ave., NW
Washinton, DC 20006, USA
Tel: (202) 662-2582
Fax: (202) 638-0036
e-mail: kenton@wri.org

Ms. Gudrun Henne
ACTS Research Associate
Yorckstrasse 75, D-10965
Berlin, Germany
Tel: (49-30) 7856427
Fax: (49-30) 8385142
e-mail: gudrun@zedat.fu.berlin.de

22-26 MAY 1995

Science and Society, Partners for the Future: 63rd Meeting of l'ACFAS (The French Canadian Association for the Advancement of Science), to be held in Chicoutimi, Quebec, at the University of Quebec at Chicoutimi.

Contact:
Christian Gohel
L'ACFAS Coordinator
425 de la Gauchetiere East
Montreal, Quebec H2L 2M7
Tel: (514) 849-0045
Fax: (514) 849-5558

13-15 JUNE 1995

17th Canadian Symposium on Remote Sensing - Radar Remote Sensing: A Tool for Real-time Land Cover Monitoring and GIS Integration, to be held in Saskatoon, Saskatchewan

Contact:
Jeff Whiting
Saskatchewan Research Council
15 Innovation Blvd.
Saskatoon, Saskatchewan S7N 2X8
Tel: (306) 933-5423
Fax: (306) 933-7817
E-mail: whij@src4330.src.sk.ca

15-19 JUNE 1995

Annual Meeting of the American Society of Ichthyologists and Herpetologists, to be held in Edmonton, Alberta.

Contact:
Joseph Nelson / Mark Wilson
Dept. Biological Sciences
University of Alberta
Edmonton, Alberta
T6G 2E9
Tel: (403) 492-5408, 492-4741
Fax: (403) 492-9234
E-mail: asih95@biology.ualberta.ca,
mark_wilson@biology.ualberta.ca

6-10 AUGUST 1995

46th AIBS (American Institute of Biological Sciences) Annual Meeting, to be held in San Diego, California. Focus: Issues relating to biology and biologists.

Contact:
AIBS Meeting Coordinator
American Institute of Biological Sciences
30 11th Street, N.W.
Washington, DC
U.S.A. 2001-4521
Tel: (202) 628-1500 or (800) 992-2427
Fax: (202) 628-1509

18-20 SEPTEMBER 1995

Third Thematic Conference on Remote Sensing, to be held in Seattle, Washington.

Contact:
ERIM / Marine Environment Conference
P.O. Box 134001
Ann Arbor, Michigan
U.S.A. 48113-4001
Tel: (313) 994-1200 ext. 3234

10-14 OCTOBER 1995

5th International Conference on Paleoceanography, to be held in Halifax, Nova Scotia

Contact:
Larry Mayer / Frank Rack
Ocean Mapping Group
Department of Surveying Engineering
P.O. Box 4400
Fredericton
New Brunswick E3B 5A3
E-mail: larry@atlantic.cs.unb.ca
rack@atlantic.cs.unb.ca

18-21 OCTOBER 1995

7th Canadian Coastal Conference, to be held in Halifax, Nova Scotia

Contact:
S. Solomon
Atlantic Geoscience Centre
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth
Nova Scotia, B2Y 4A2
Tel: (902) 426-9459
Fax: (902) 426-4104
E-mail: solomon@agcrr.bio.ns.ca

Book and Periodical Niche

Parks and protected areas in Canada: Planning and management

Edited by Philip Dearden and Rick Rollins. 1993. Oxford University Press, Toronto. 298 pp. with appendices. Softcover. ISBN 0-19-540908-6. CAN$24.95.

This volume contains well-balanced articles by several contributors about the complex problem of planning and managing the Parks and protected areas in Canada. It is well referenced and easily read, and it readily avails itself to the needs of the undergraduate student of park planning and management, as well as several other disciplines.

The book focuses mainly on large natural parks in Canada's national park system. Two chapters address provincial park systems, and one examines parks legislation and practice at various levels of government. Other chapters discuss the history and functioning of the national park system, including aspects of conservation, visitor and resource management, nature interpretation, native interests, marine parks, and Canada's moral obligation in world conservation.

The editors touch upon such timely and important topics as carrying capacity, concession management, research, visitor use, and boundary impacts. The book follows the basic premise that parks can no longer be all things to all people and that to attempt to do so would bring about the demise of the very things we are trying to preserve.

Many of the issues and concerns discussed can be applied to the parks of any developed country and indeed, "...most of the literature ... has appeared in foreign publications, mainly American." Yet, it contains a purely Canadian perspective.

This book brings forth fundamental questions of changing values in our society reflected by a tendency to now view parks as places of conservation, rather than necessarily places of recreation. Certainly, as Dearden and Rollins state in chapter one, "The Times They Are A-Changin."

Frank F. Drumm, Jr., Volunteer, National Park Service Library, Denver, Colorado.

Insect life-cycle polymorphism: Theory, evolution and ecological consequences for seasonality and diapause control

Edited by H.V. Danks. 1994. Kluwer Academic Publishers Group, P.O. Box 358, Accord Station, Hingham MA 02018-0358. 376 pp. Hardback. ISBN 0-7923-2828-0, NLG 325.00/GBP 130.00.

Recent studies have shown that genetic polymorphisms play an important role in structuring the seasonal life cycles of insects, complementing an earlier emphasis on the effects of environmental factors. This book presents current ideas and recent research on insect life-cycle polymorphism in a series of carefully prepared chapters by international experts, covering the full breadth of the subject in order to give an up-to-date view of how life cycles are controlled and how they evolve. By consolidating our view of insect life-cycle polymorphism in this way, the book provides a staging point for further enquiries.

The volume will be of interest to a wide variety of entomologists and other biologists interested in the control and evolution of life cycles and in understanding the extraordinarily complex ecological strategies of insects and other organisms. [Publisher]

Studying global change

Fautin, D.G., Futuyma, D.J., and James, F.C. (editors). 1992. Special section on global environmental change. Annual Review of Ecology and Systematics 23:1-235.

Kareiva, P.M., Kingsolver, J.G., and Huey, R.B. 1993. Biotic interactions and global change. Sinauer Associates, Sunderland, Massachussetts. xii+559 pp.

Heyer, W.R., Donnelly, M.A., McDairmid, R.W., Hayek, L.A., and Foster, M.S. 1994. Measuring and monitoring biological diversity; Standard methods for amphibians. Smithsonian Institution Press, Washington & London. xix+364 pp.

The **1992 Annual Review of Ecology and Systematics** (ARES) devotes 9 chapters by 20 authors to global environmental change. The introduction identifies changes in atmospheric composition, climate, land use, and atmospheric chemistry, declines in stratospheric ozone and biodiversity, and biological invasions as the components of this change, and introduces them with the idea that "global studies are likely to be among the most important concerns of ecological research and teaching for some decades" (p. 1). Two chapters deal with subjects that are tractable using current methods: Consequences of invasions by exotic grasses, and the climate of the past three million years.

The remaining chapters try to anticipate the kinds of data and analysis that may suffice to understand changes in various ecosystems, or to span the gap between small-scale phenomena currently studied and their global consequences, largely by imagining every possible factor, how these might interact, and how they might be measured all over the Earth. This structure is then decorated with the few existing relevant studies, each of which would have to be expanded into a vast literature for its subject to be understood globally. Modelling CO_2 fluxes, for example, depends on understanding the resorption of nitrogen from senescent roots, the rate of decomposition of "root litter," and how this rate might change: studies of an Alaskan Sedge and introduced Pines in New Zealand are cited.

Biotic Interactions, the proceedings of a 1991 workshop, treats much the same ground, emphasizing terrestrial and freshwater ecosystems, in 29 excellent chapters by 45 authors, 4 of whom are authors or editors of the ARES special section. The scope of this work is more congenial to its subject, and the writing is good, though not edited down to terseness, and with a rhythm within chapters that is sometimes like a night of falling asleep and waking up every 20 minutes, ["Global crisis," "impossible complications," "more funding for my field"] as if each chapter were an independent publication, or meant for a less focused volume.

The theme, which runs through sections on patterns and determinants of climate and landscape change, physiology and population responses, evolutionary responses, community responses, habitat fragmentation, and the context for research on global change, is suturing fields of knowledge developed in widely different spatial and temporal scales. There are heroic challenges here for those who build or hope to build models that will pull together projections of climatic change, loss of biodiversity through habitat fragmentation, introductions of exotic organisms, and the whims of human fashion and politics into useful models of how the Earth's biota may change in the next century.

The authors individually deny its possibility, but the cumulative effect is a plea for enough support to develop a grand ecological orrery, which will show the position of every species and community after every possible perturbation. Unfortunately, each chapter's model depends on simplifications that other chapters decry as fatal to understanding responses to change, and one wonders if the models can stand having all these truckloads of new parameters dumped into them, or whether they will collapse into arbitrariness, and one wonders where the exponential truckloads of data required to verify the models are going to come from.

Leopard frog (*Rana pipiens*) by Charlie Douglas, from Natural History Notebook, Series 1. With permission from the Canadian Museum of Nature.

Just as the models cannot accommodate phenomena described at disparate scales, the general argument of the book is cast at an inappropriate scale. We cannot predict the ecological future with transit-of-Venus precision any more than we could have predicted the Kangaroo, though we can predict that isolated lands will breed strange beasts, and that conventional human settlement will lead to their decimation. Every author knows what is required to ameliorate global change, but political insistance on scientifically inappropriately detailed kinds of "proof," and the hope that their research can be of use, perpetuates the idea that monitoring, research, and modelling of this kind can, by itself, have much effect.

Global environmental change will not be ameliorated by continuing with business as usual while naturalists fiddle with models to try to sneak biodiversity and global integrity into an over-peopled Earth. Here we must reason from first principles, not proof-text our way to a foregone conclusion.

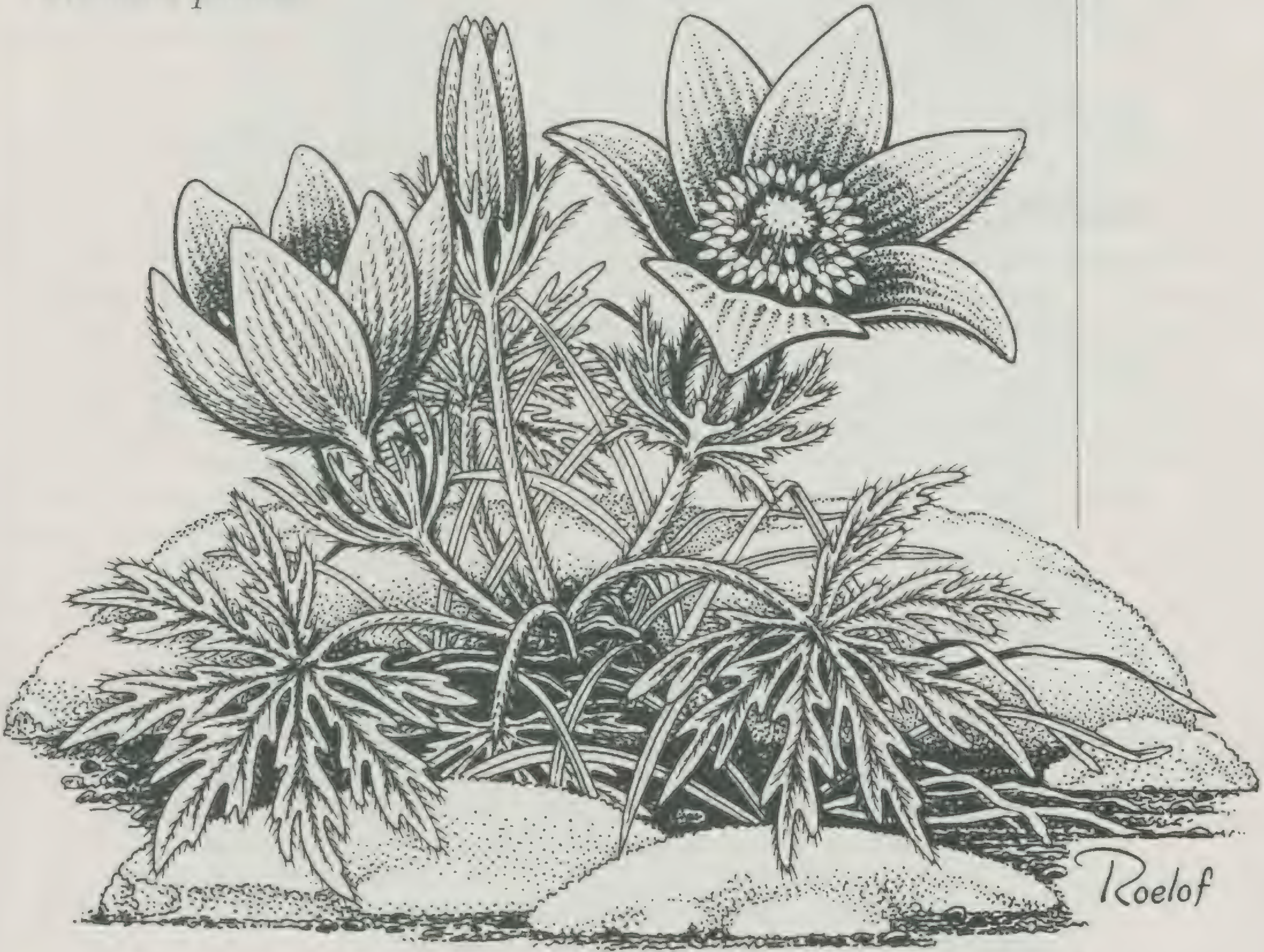
We need something like the World human population of 1939, with a global "standard of living" similar (though with pollution controls) to Europeans' in that era, substantial broadly interconnected wild lands and waters, democratic government, and universal literacy free from monopolistic media manipulation. This may not be the ideal equilibrium state for the planet, but it would be an appropriate memorial to the victims of war and development, and while societies are moving towards it, ecological research about global change would not have to be driven by hopeless panic.

The hypothesis of global amphibian decline is one recent panic (in which the author of this review fully participates, having spent the spring of 1994 not hearing hylid frogs at the urbanized stations of a wetland auditory monitoring transect along the north shore of Lake Ontario). **Standard Methods for Amphibians** is a manual for studying population changes, the first of a series of Biological Diversity Handbooks planned by the Smithsonian Institution. Chapters on Amphibian diversity and natural history, essentials of standardization and quantification, data and planning, inventory and monitoring techniques, supplemental approaches, and estimating population size, and appendices on handling live amphibians, marking techniques, recording calls, preparing specimens, and collecting tissue for biochemical analysis are reassuringly standard, rehearsing what one has already been doing, or would do if one needed to undertake the kind of studies described.

...continued on page 44

Prairie Crocus

Anemone patens



This species, also known as the Pasque Flower, is the official floral emblem of Manitoba, Canada, and the state flower of South Dakota, U.S.A. The lavender or mauve blooms are a welcome harbinger of spring as they push up before leaves have developed, often before the snow has melted. The Prairie Crocus (or Prairie Anemone) is a member of the Buttercup or Crowfoot family Ranunculaceae and is a conspicuous, often common plant on open prairie and hills throughout the prairie ecozone. It is especially abundant on burned-over prairie, overgrazed pasture and railway rights-of-way and has been known to poison sheep. Over the course of a season, the flowers, which are approximately 5 cm in diameter, are replaced with a cluster of silky white hairs bearing the seeds.

compensating for environmental variables in comparing observations made under different conditions. All monitoring schemes gather environmental data, but these data need to be compounded into models and formulae, for example, calculating the probability that at a given location, date, time, and temperature, a species of frog will be heard calling if populations are present. This volume is a really admirable summary of the cumbersome old methods that made population monitoring a labour-intensive side-branch of herpetology, but it does little to point the way towards new techniques or analysis needed for monitoring amphibian populations regionally as indicators of global change.

Bullfrog (*Rana catesbeiana*) by Charlie Douglas, from Natural History Notebook, Series 2. With permission from the Canadian Museum of Nature.

Most chapters are collaborative efforts (by a total of 47 authors and contributors, none shared with the other volumes), but single-authored chapters by Lee-Ann Haycek, statistician to the Smithsonian Institution, are more idiosyncratic in the detailed attention given to some statistical problems (e.g. contingency tables, coefficients of similarity, randomization) at the expense of others (regression, multivariate analysis). She concludes that "manipulation of field data or compilation into standard tabled summaries is fruitless, in general, unless carried out under the discerning eye of an expert" (p. 244), which seems to condemn to failure the monitoring efforts of those too isolated or shy to approach such experts.

Many of the methods advocated seem best adapted to inter-tropical terrestrial wilderness, where amphibians are abundant, large numbers of species are present, human movement through habitat is not hindered by implacable vegetation or unstable soil, and where amphibian activity is not intensely and unpredictably seasonal. The insistence on statistically proper randomization procedures and gridded study arenas is less applicable to places (boreal forest, residential suburbs, impenetrable Beaver impoundments) where most of the investigator's time is spent finding or reaching the sites where amphibians occur or persist.

The authors are "concerned that personnel from government agencies may wish that amphibian studies be accomplished during specific periods for reasons unrelated to science," (p. 272) but no one can be everywhere on that one optimal night for observing amphibian populations, so we need means of

Do such methods exist? Why understand global change? Can one get support to study the physiology of root senescence in order to understand global change—support that would not be available to study root senecence for its own sake—and would such study help avert global deterioration? Would such a programme find the support that systematics and ecology have been denied through this century during the ascendency of the indoor sciences? Would it distort natural history and ecology by assigning scientists to globally desirable ends in the same way that support for medical research now distorts fields considered relevant to medicine? What use might governments or peoples, who cannot now see a crisis or take action, make of such a global ecological understanding?

One hopes that a programme of understanding everything would provide work for everybody, each studying what he naturally thinks important, but fears that it would result in a bureaucratic suffocation of independent investigation under a nightmare of regulation, arbitrary classifications, and outdated theories embedded in billion-dollar institutions. The rest of the chapters in the ARES volume sample what we may be giving up: the freedom to study evolutionary consequences of hybridization, nearly neutral models of evolution, artificial selection, gastropod phylogeny, trace fossils, behavioural homology, comparative methods, computation-intensive data analysis, phylogenetic taxonomy, population viability analysis, and the fitness of behavioural programmes.

Frederick W. Schueler, Biological Checklist of the Kemptville Creek Drainage Basin, Bishops Mills, RR #2, Oxford Station, Ontario, Canada K0G 1T0

Cladistics: A practical course in systematics

By P.L. Forey, C.J. Humphries, I.J. Kitching, R.W. Scotland, D.J. Siebert, and D.M. Williams. 1992. The Systematics Association Publication No. 10, Oxford University Press, Oxford. xi + 191 pp., ISBN 0-19-857767-2, CAN $81.00.

This reviewer completed his university training before the cladistic revolution had spread widely among Anglophone systematists. He thus represents a cladistically naive audience, the edification of which is the purpose of this small, compact volume. Encompassing such topics as basic terminology, assessing character polarity, constructing the simplest possible phylogenetic trees from the maximum amount of information, deriving phylogenies from DNA sequences, incorporating data from the fossil record, deducing paleogeographies and evaluating implications for formal taxonomy, the volume is a workshop manual for an intensive, one-week course (see Preface).

Did the volume fulfil its purpose? Although the text is primarily narrative and often conceptual, sections of it require an intellectual commitment sufficient to master a mathematics textbook. Reference to development of thought are usually not obtrusive, but occasionally tradition obscures pedagogy as in denoting kinds of parsimony (of the Wagner, Fitch, Dollo and Camin-Sokal varieties). The topics are well-encapsulated, facilitating review. There is good counsel, and alternative models and interpretations are well explained. It is concise, but contains a bibliography of over 300 citations (which for the past decade incorporates an average of 20 titles per year) providing evidence that cladistics continues to attract thoughtful consideration. For this pupil, a collegially-minded instructor would have been a valuable complement to the book, which is, after all, a textbook for a course.

It is also an interesting book. One has the impression that cladistic analyses emphasize theory, for their predictions appear (of necessity?) not to have been well compared with real phylogenies, which would have been useful in revealing methodological shortcomings and facilitating their statistical evaluation. In ongoing research, cladograms for some fossil organisms (such as dinosaurs) are frequently tested and modified following the addition of new materials to a very incompletely known record; the changes engendered by this process would make a very interesting study. In the sections concerning DNA analyses, abundant reference is made to the implications of time on the length of branches. It would have been interesting to see an analogous discussion based on skeletal data from the fossil record. The suggestion that homoplasy eventually overwhelms the phylogenetic signal preserved in DNA (p. 111) also invites comparison with the phylogenetic implications of the anatomy of "living fossils."

Are there limitations to cladistic methodology? For example, if phylogenetic analyses provide a means of corroborating habitat fractionation, as implied by geological evidence, how could they be applied to reveal habitat amalgamation? Extinction, both background and catastrophic, characterizes the history of life; could extinction be as effective as homoplasy in obscuring phylogeny? Although synapomorphy is the "signal" for phylogeny, might homoplasy not be an equally important "signal" for evolution? The avenues of thought opened by cladistics might indeed lead us toward new perspectives, with the happy result of "...redress(ing) a decline in the teaching of systematics and taxonomy," which is the reason why the authors wrote this very stimulating book (p. 1).

Dale A. Russell, Research Scientist, Paleobiology, Canadian Museum of Nature

A Complete Guide to the Freshwater Fishes of Southern Africa

By Paul H. Skelton. 1993. Southern Book Publishers, Halfway House. xiii + 388 pp. ISBN 1 86812 350 2 (soft cover), 1 86812 493 2 (hard cover), 1 86812 494 0 (collectors' edition).

This book briefly describes, figures, and maps the distribution of 245 species of fishes in southern Africa (South Africa, Namibia, Botswana, Lesotho, Swaziland, Zimbabwe, and the southern parts of Angola, Zambia, Malawi and Mozambique).

The first 86 pages are a typical general introduction to geography, history of research (with line drawings of past ichthyologists from which we deduce hairiness was a 19th century trait), environment, conservation, classification, collection and preservation, and a key to families. The introductory part has a number of excellent colour habitat photographs as well as colour drawings to illustrate the anatomy and biology sections. The last 20 pages have a glossary, references, and reading list (only 2 pages), addresses of museums, angling associations and fishery authorities, and an index to common and scientific names. 279 pages cover the species accounts, with about half to one page per species along with family and genus accounts.

Each species account comprises an English, Afrikaans and scientific name, a colour painting of the fish, a distribution map with range marked in red, a description (fin ray and scale counts, other characters, colour and size), distribution, biology and ecology, uses and, variably, relationships and notes. There are keys to genera and species within each family.

Common synonyms are not listed so that anyone referring to older literature would easily be confused. Symbols are used for size, conservation status, alien species, and human use. I admit to a loathing for these little icons, I can never remember what they mean and it is irritating to have to relocate the key to refresh my memory. Some of the worldwide family distribution maps are inaccurate at their margins (salmonids don't live on the Greenland ice-cap; cyprinodontiforms are found over a wider range in Southwest Asia). The colour of some of the illustrations is incorrect—goldfish are a peculiar yellow, for example. The placement of keys within the text is inconvenient; I would prefer to see them grouped together in one section.

This is an excellent overview of the freshwater diversity in fishes for this part of the world. The book is colourful, the text readable, and the layout easy to follow. It will greatly facilitate ichthyological studies by students of all ages and backgrounds.

Brian W. Coad, Research Scientist, Ichthyology, Canadian Museum of Nature

Rogue primate: An exploration of human domestication

By John A. Livingston. 1994. Key Porter Books, Toronto. 228 pp., paperback, ISBN 1-55013-508-2. CAN $21.95.

*Congratulations to John Livingston. *Rogue Primate* won the 1994 Governor General's Award for Non-fiction.

In the fifteen years or so I have been following environmental and social injustices—going to rallies, reading reams of newspaper and magazine articles, and attending special lectures by such luminaries as the late Linus Pauling and Ralph Nader—there has been one sad trend throughout. The speakers or writers usually preach to the converted. The people who really need their eyes opened to the dangers of radiation or Reaganism stay away in droves. The worst thing I can say about John A. Livingston's wonderful new book, *Rogue Primate*, is that it, too, has almost guaranteed itself a "pre-converted" audience.

This is an audacious, uncompromising, but brilliant extended essay on the way *Homo sapiens* has waged war on the planet's biodiversity through domestication, starting with our own species. While selective breeding and artificial support (i.e., at a remove from natural forces) characterize the domestication of plants and animals for the past 15,000 years or so, human self-domestication has been achieved through technology. According to Livingston, "[i]n human societies, ways of doing have supplanted ways of being." It is our mastery of "storable, retrievable, transmissible technique" that has allowed us to surpass carrying capacities all over the globe, to invade almost every climatic zone successfully, to exploit populations of flora and fauna for food and other needs and whims, and to be, despite famines, epidemics and natural disasters, relatively immune to the pressures other species must face all the time.

"No wild animal of our size could possibly have achieved our level of world population, much less have tolerated our level of density, and no wild animal of any size could possibly have so transformed the face and function of the biosphere. Domestication confers special gifts, the most important of which is relative freedom from the pressure of natural selection.... In return..., we have handed back... the quality of natural, integrated belongingness" (page 13).

For most of the book, Livingston rails against the ideologies and institutions spawned by our technophilic species: modern medicine, wildlife management, agrobusiness, animal rights, and what he calls "zero-order humanism." He eloquently argues that any belief or practice that divides us from nature is a way of conquering it. Medicine denies the role of death in the cycle of life. Wildlife management controls natural populations—not those who would run rampant, exploiting all available "resources." Animal rights is a well meaning but misguided application of yet another human artifice to wild beings. And zero-order humanism is the quasi-religious tenet that dictates and justifies all manner of atrocities—from building power dams to vivisection. *Rogue Primate* ends on a hopeful note. Livingston points out that the bond with nature evident in young children can be nurtured so that it carries well into adulthood.

After seeing how the average adult breaks that bond, the only hope for the planet seems to be in letting more child-like wonder prevail.

Louise Fabiani, a student of John A. Livingston's while she earned her Master's in Environmental Studies at the Faculty of Environmental Studies, York University, 1989-91.

Clayoquot mass trials: Defending the rainforest

Edited by Ron MacIsaac and Anne Champagne, foreword by Robert F. Kennedy Jr. 1994. New Society Publishers, P.O. Box 189, Gabriola Island, BC, V0R 1X0. 224 pp., 300+ illus. In Canada Pb ISBN 1-55902-253-X $19.95, Hb ISBN 1-55092-252-1 $47.95; USA Pb ISBN 0-86572-321-9 $17.95, Hb ISBN 0-86571-320-0 $42.95.

Clayoquot Mass Trials: Defending the Rainforest presents a unique look at the massive civil disobedience action at Clayoquot Sound, on Canada's extreme west coast, during the summer of 1993. Over 800 people put themselves on the line in a concerted attempt to halt further destruction of one of the last regions of temperate rainforest in the world.

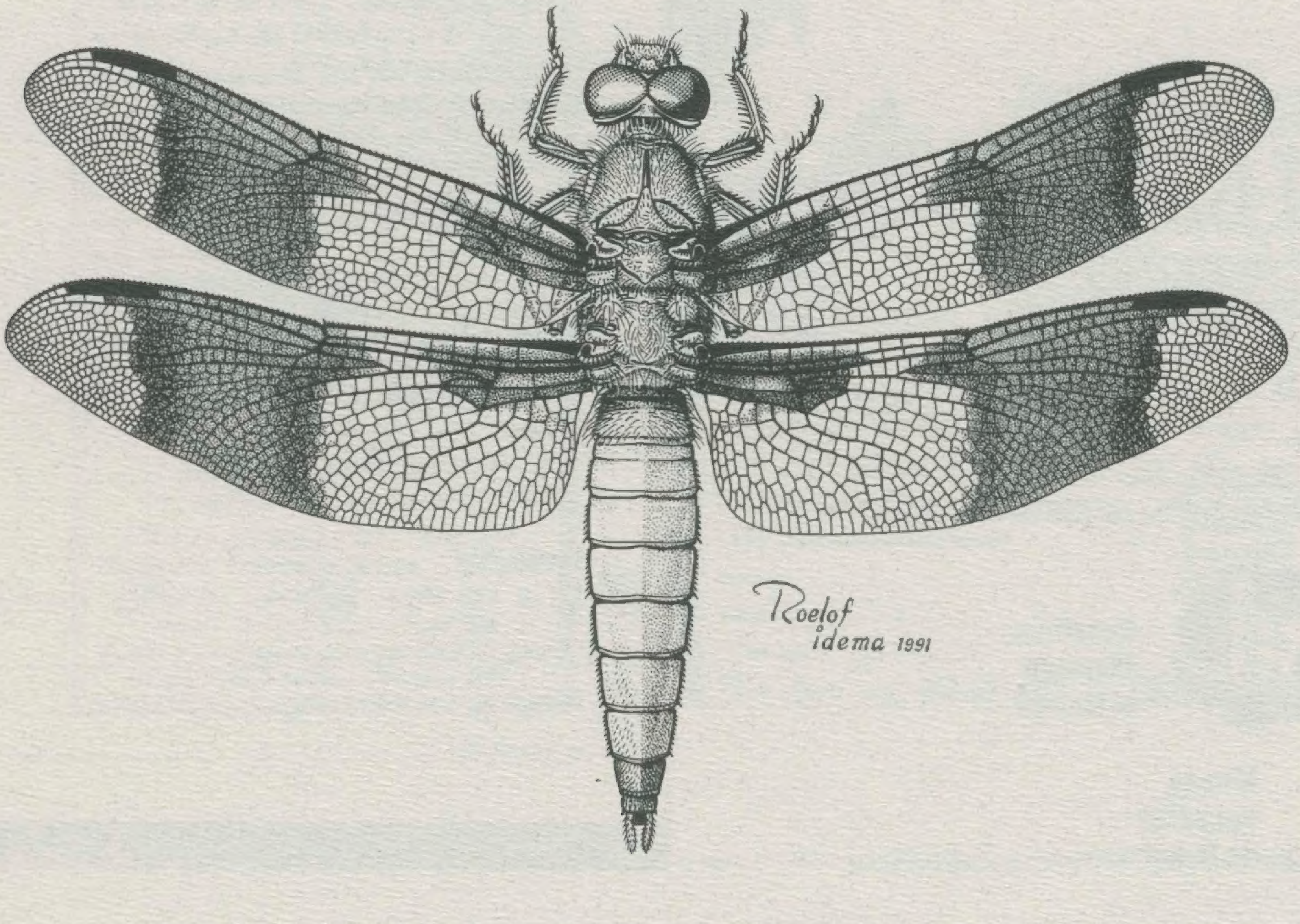
Their actions led to the largest mass trials in Canadian history. In the court, these people were eloquent in their descriptions of why they chose to block the logging trucks. Using court testimony and a wide variety of supporting materials, the book highlights the crisis in the rainforests worldwide (and in western Canada, in particular), the ethical stance of civil disobedience in reaction to this crisis, and the miscarriage of justice performed by the courts.

Royalties from the sale of this book will go to the Friends of Clayoquot Sound. [Publisher]

Wetlands poster available

National Resources Canada, in partnership with the Canadian Wildlife Service, Ducks Unlimited, and the North American Wetlands Conservation Council, has recently released A Wetlands Poster Map for Canada. This colourful map summarizes in a readily accessible format current information about the Canadian wetlands—their location, current status, and possible future; factors contributing to the loss of wetlands; the social and economic value of these regions; and the extreme importance of wetlands to Canadian and global ecosystems. Copies of this poster map may be obtained from the Canada Map Office, National Resources Canada, Ottawa, Ontario, K1A 0E9, (613) 952-7000; 1-800-465-6277. The retail price is $9.95; significant discounts are available for orders over 25 copies.

Susan Swann, Canadian Centre for Biodiversity, Canadian Museum of Nature, Ottawa



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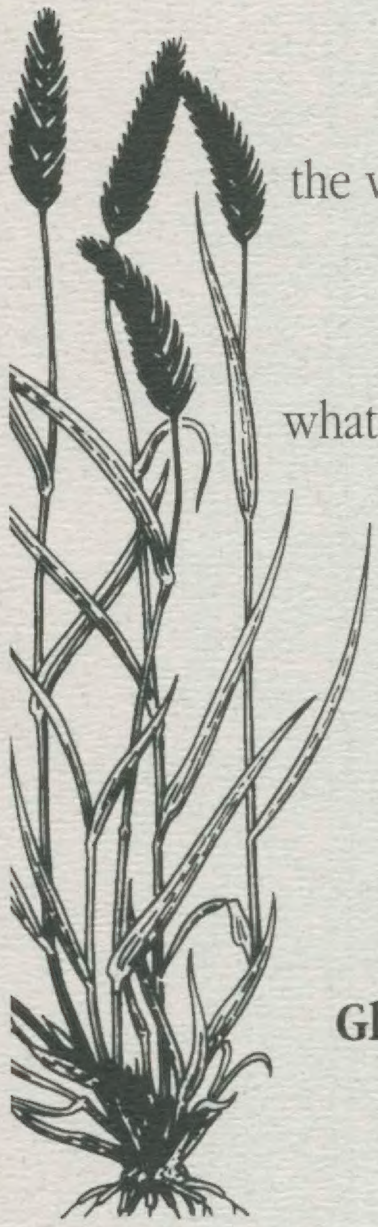

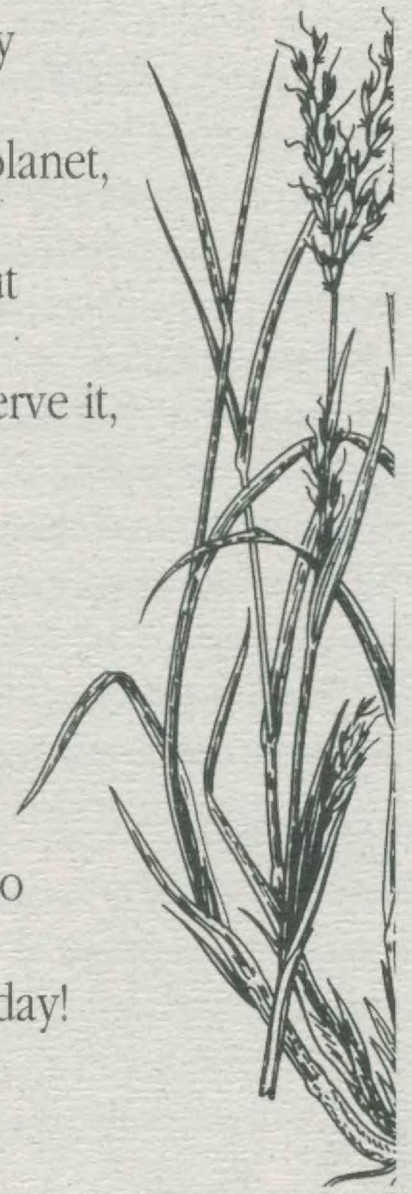

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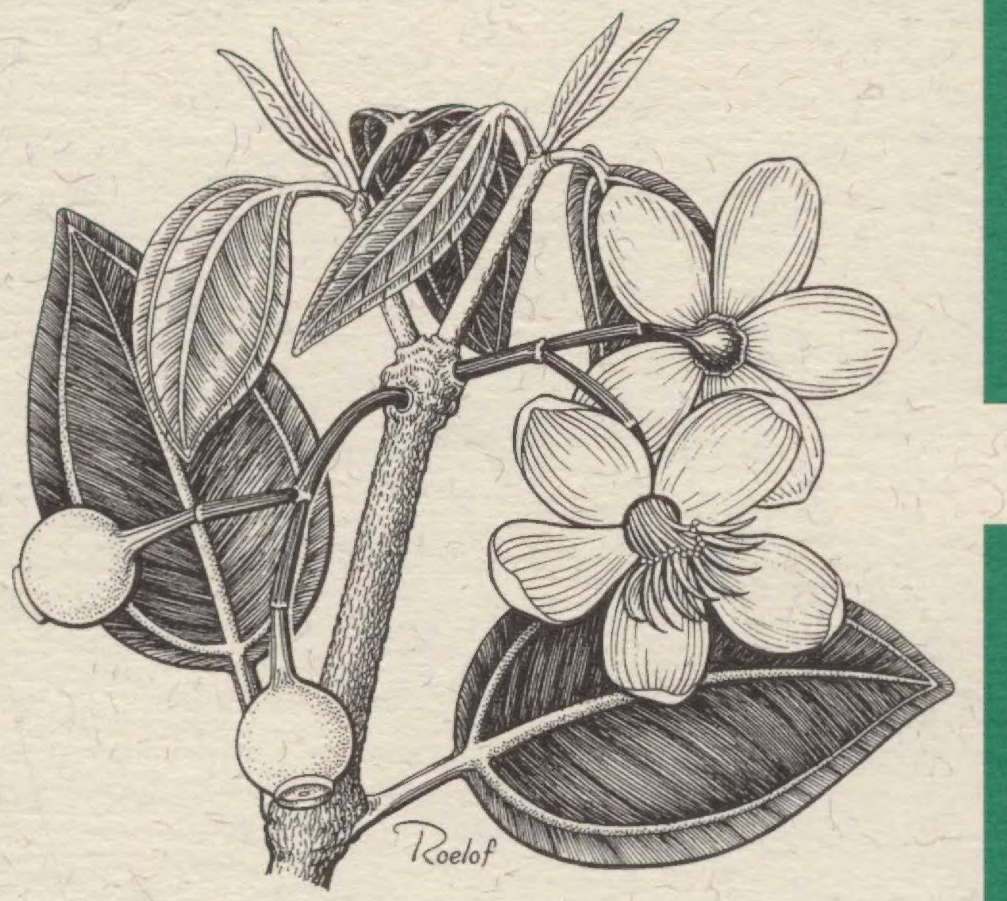

Medinilla speciosa

The *Melastomataceae* are a tropical family of over 4,000 species of herbs, vines, and shrubs in 200 genera. Members of the genus *Medinilla* make fine ornamentals. They have striking taxonomic features such as, opposite leaves with curved ribs diverging palmately from the base, stamens with curious clawlike appendages, and anthers with openings as pores at the top and not by longitudinal slits. The stiff, thickened stems are also obvious in this illustration of *Medinilla speciosa.* For an account of finding a new Melastome species, see pages 19-21.

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